DECEMBER
1954
35c

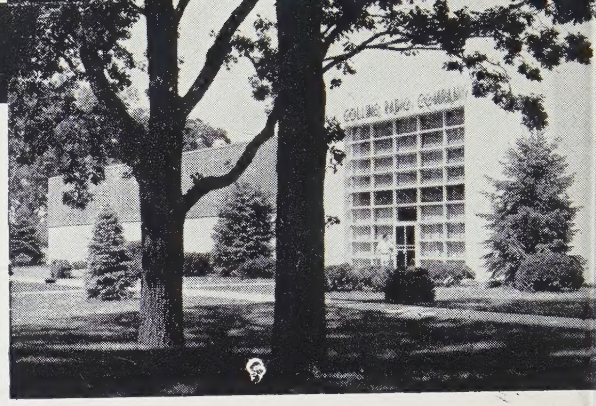
CQ

RADIO AMATEURS' JOURNAL

In This Issue =

- Ultimate Mobile Receiver
- Common Sense Antenna Design
- Home-built Heterodyne Exciter

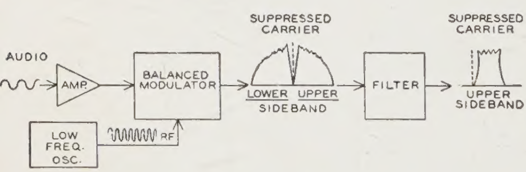
ENGINEERING NOTES



GENERATING SSB SIGNALS

The actual generation of the single sideband signal ; perhaps the most important part of a SSB trans-iitter. In designing this part of the circuit, careful onsideration should be given to the band width of ie signal generated. Without careful design, this and width can be much greater than would be ex-ected and can cause considerable adjacent channel nterference on both sides of the desired signal. The iost desirable performance characteristics of an SSB enerator would be the ability to generate the desired ideband, completely suppress the undesired sideband nd suppress the carrier. Practical design permits sup-ressing the undesired sideband and carrier by more han 40 db. Following is a discussion of one way that hese performance characteristics may be obtained.

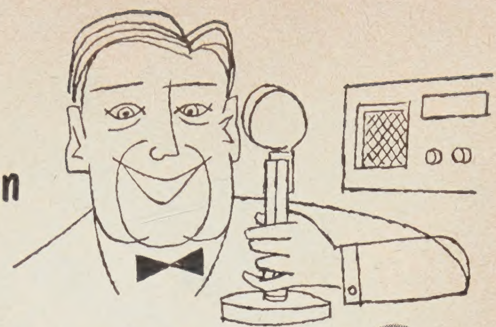
The block diagram below shows a "filter" type ingle sideband generator.



t shows how the audio and RF signals are combined n the balanced modulator and how the filter removes ne sideband. If the balanced modulator is properly djusted, the carrier can be reduced 40 db or more. Care must be taken in the design of any balanced modulator in order to prevent the RF output from coupling around the balanced modulator and being re-inserted in a later stage. This undesired coupling can be caused by stray capacitive coupling or by coupling through common power leads. Unwanted coupling around the balanced modulator will not al-ow complete suppression of the carrier.

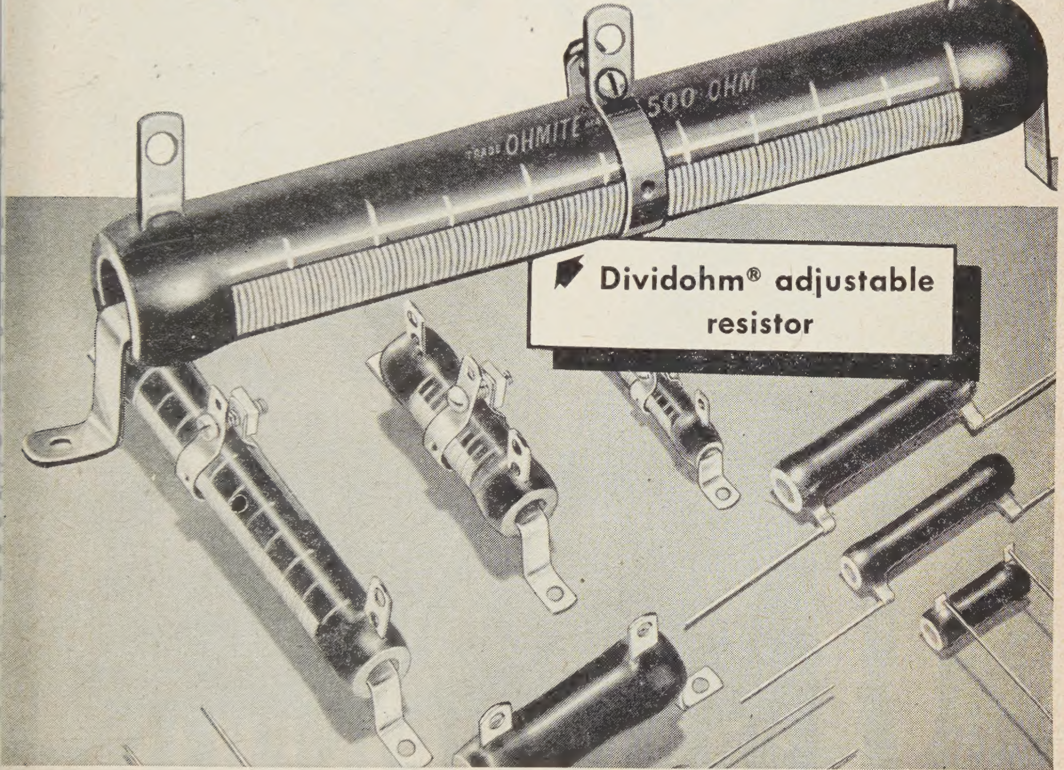
The output of the balanced modulator contains both sidebands and has the RF carrier suppre All the modulation components passed by the a amplifier will appear as sidebands in the outpu the balanced modulator. In order to limit the t mitted bandwidth to only that required for a s factory communications circuit, it is necessary to strict the passband at some point in the transm circuitry. This is most easily done by the filter fo ing the balanced modulator. This filter is requ to do several things. (1) It should pass the de sideband. (2) It should limit the bandwidth of desired sideband to that required for an intelli communications circuit. (3) It should provide quate suppression to the undesired sideband. (4) should provide some attenuation to the carrier quency. The Collins Mechanical Filter Type 45 will satisfy the above requirements. It provid transmitted bandwidth of 3100 cps. It does no quire the use of any additional audio bandpass fi It provides at least 60 db of attenuation to the u sired sideband. No manual adjustments are requ to maintain this attenuation. It will provide bet 12 and 18 db of attenuation to the carrier frequ thereby reducing the requirement for a high degr carrier balance in the balanced modulator.

The principal advantages of the filter type s sideband generator are its ability to maintain its formance characteristics indefinitely; there are controls, such as the critical ones required by systems for RF and audio phasing, to get out o justment, and there are no critical phase shiftin audio bandpass networks required. Optimum per ance can be easily provided with a Mechanical exciter. When operating SSSC, we should make that we are utilizing the advantages offered by system and that we are operating with a single band, with the carrier suppressed.



For a rig you can rely upon
Use dependable

OHMITE® RESISTORS



When you're on the air . . . and your rig goes dead . . . what can be more exasperating? Make sure it isn't *resistor trouble* by standardizing on OHMITE resistors, with a world-wide reputation for dependability. Available in wire-wound, vitreous-enameled type; fixed (5 to 200 watts); and adjustable "Dividohm" (10 to 200 watts). Also "Little Devil" composition resistors (½, 1, and 2 watts in all RETMA resistances), plus many others for special and experimental uses.

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OHMITE MANUFACTURING COMPANY
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Skokie, Illinois
(Suburb of Chicago)

OHMITE RHEOSTATS • RESISTORS • TAP SWITCHES

December, 1954
Vol. 10, No. 12

OUR COVER PHOTO

Bobby DeGood, four-year-old harmonic of Harold DeGood (WØARO), calls Santa on his Dad's Ham gear.

CQ

Feature Articles

Departments

Miscellaneous

CQ—(title Reg. U.S. Post Office)—is published monthly by Cowan Publishing Corp. Executive and Editorial offices, 67 West 44th Street, New York 36, N. Y. Phone MUrray Hill 7-2080. Reentered as Second Class Matter February 6, 1951 at the Post Office, New York, N. Y. under the Act of March 3, 1879. Subscription rates in U.S.A. Possessions, APO & FPO, 1 year $3.00; 2 years $5.00; 3 years $7.00. Elsewhere add $1.00 per year for postage. Single copies 35 cents. Printed in U.S.A.

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Last Minute DX Items

HKØ/San Andres acceptance will be mad retroactive to World War II instead of May 1954 as stated in September *CQ*.

We have word of a Soviet expedition to th North Pole. Activity was scheduled to hav started on October 31 with two stations signin *UPOL3* and *UPOL4*. These stations wer active on frequencies from 7000 to 7050, VFC at the following times: Sundays, 1300 to 150 and 1830 to 1930 GMT. Thursdays, 0100 t 0300 and 1600 to 1700 GMT. The length o their stay was not determined *VQ8CE*

NAVASSA ISLAND (KC4AA-KC4AZ)

The CQ DX Committee has voted to add Navassa Island to its official country list. Credit will be given, on the WAZ/HONOR ROLL listings, for contacts dating from the close of World War II.

Chagos Islands, has been heard on 14050 (wit FB8XX) at 1100 GMT . . . . During the *World Wide DX Contest* disturbances were might unkind to the phone section. Marked improve ment was noticed for the CW period with ex cellent 21 Mc. openings and South America activity on 28 Mc. 160 meters was disappoint ing however and 3.5 and 7 were below par *W8JIN* rolled up 456 contacts for an approxi mate 305,000 points. Sam, *4X4BX*, was way u there again with 750 contacts and a multiplie of 250 while Beda, *OK1MB*, QSO'ed 450 wit a 250 multiplier. *KV4AA* kept on the good sid of the W's (I hope) by dispensing 854 contact for a modest 113,000 while a 14-hour stint a

NEWFOUNDLAND

The committee has also decided to re-establish Newfoundland on the country list. Credit will be allowed for any contacts with Newfoundland prior to its union with Canada on March 31, 1949 (VO contacts will be re-added to all lists where formerly deleted. Others please submit Newfoundland/ Labrador contacts).

VQ6LQ resulted in 17 zones, 41 countries and 113 QSO's. To sum it up we would say "Swell brawl, bigger and better than ever" . . . . *MP4BBL* still awaits QSL's from G-land and upon receipt will confirm 100 per cent . . . A new Ham in Nicaragua is Floridas W4SXD. He is on as *YN1PM*. . . . Jim, ex KP4YC now keys from *W5GRL/5* while ex-KP4UE, also Jim, may be heard from Shelby, Ala., as *K4AGE*. . . . Via *West Gulf Bulletin* W1FH says *FB8BC* and *ZD9AC* are active on 21 Mc. and W5UUK states that *ZS7D* is available daily on 14145 at 1600 GMT.

is the time for all good Hams to
the pleasure of receiving one of
world's finest gifts—a genuine
crafters.

d New and very much wanted—
el HT-30 Single Sideband AM
CW Transmitter/Exciter.

ghly stable VFO with full 100:1
tio gear drive system built-in,
librated in kc.

ability comparable to most crys-
s .009%.

ll band switching.

mple gain for 55 db microphone.

um and noise 40 db down.

ll 50 watt peak power output.

mplete built-in metering.

nwanted sideband at least 40 db
wn.

ndesired beat frequency down 60
or more.

able 50 kc filter system.

V. I. suppressed.

ovisions for coaxial output fitting.

uilt-in voice control circuit with
as switching for final amplifier.

M—CW—SSB—19 tubes plus
ltage regulator and 2 rectifiers.

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7, Station R
to 17, Ontario, Canada

To Our Readers:

In a magazine, such as *CQ*, which keeps growing month after month, the point is soon reached where the publisher must consider ways and means of improving his services. Essentially speaking, he wants to get a good readable journal into his subscribers' hands well before the first of each month. We are the first to admit that in the past this hasn't always been the case.

Because of the size and distribution of *CQ* we have outgrown our present printing facilities, and starting with the January issue this magazine will be handled by one of the largest printing shops in New York City. Simultaneously steps will be taken to speed up the mailing and newsstand distribution. We could say a lot about what we plan for *CQ* in this particular vein, but we would much rather just let you see for yourself.

The January issue, which will be on your newsstand during the last week of December and which will be in subscribers' hands (Christmas mailing rush permitting) well before New Year's Day will contain both the feature story by Bill Scherer, W2AEF, on the "Q-Multiplier," and the one by Jack Brown, W3SHY, on the SSB exciter using a 50-kc. Burnell filter. The cover feature is a "Strap Set" portable, designed by WØURQ.

73,

Perry Ferrell

"The Hams have just voted me the 'Chassis With The Most Sensitive Reception.'"

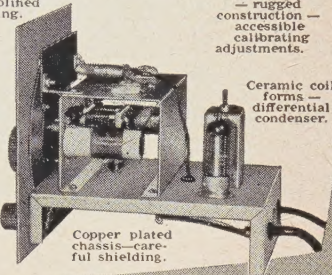
New *Heathkit* VFO KIT

MODEL VF-1

$19.50

Ship. Wt. 7 lbs.

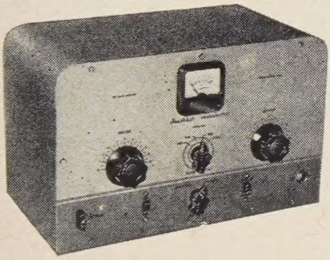
- Smooth acting illuminated and precalibrated dial.
- 6AU6 electron coupled Clapp oscillator and OA2 voltage regulator.
- 7 Band coverage, 160 through 10 meters—10 Volt RF output.
- Copper plated chassis—aluminum cabinet—easy to build—direct keying.



Here is the new Heathkit VFO you have been waiting for. The perfect companion to the Heathkit Model AT-1 Transmitter It has sufficient output to drive any multi-stage transmitter of modern design. A terrific combination of outstanding features at a low kit price. Good mechanical and electrical design insures operating stability. Coils are wound on heavy duty ceramic forms, using Litz or double cellulose wire coated with polystyrene cement. Variable capacitor is of differential type construction, especially designed for maximum bandspread and features ceramic insulation and double bearings.

This kit is furnished with a carefully precalibrated dial which provides well over two feet of calibrated dial scale. Smooth acting vernier reduction drive insures easy tuning and zero beating. Power requirements 6.3 volts AC at .45 amperes and 250 volts DC at 15 mills. Just plug it into the power receptacle provided on the rear of the AT-1 Transmitter Kit. The VFO coaxial output cable terminates in plastic plug to fit standard ½" crystal holder. Construction is simple and wiring is easy.

Heathkit AMATEUR TRANSMITTER KIT



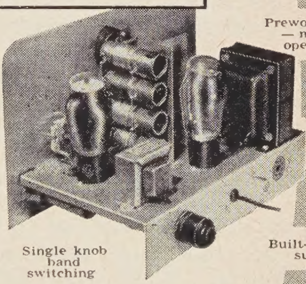
MODEL AT-1

$29.50

Ship. Wt. 16 lbs.

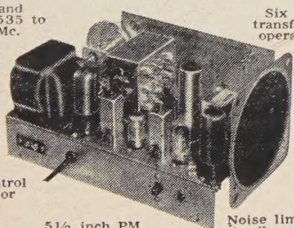
SPECIFICATIONS:

Range 80, 40, 20, 15, 11, 10 meters.
6AG7 ....Oscillator-multiplier.
6L6 ....Amplifier-doubler
5U4G .... Rectifier.
105-125 Volt A.C. 50-60 cycles 100 watts. Size: 8⅛ inch high x 13⅛ inch wide x 7 inch deep.



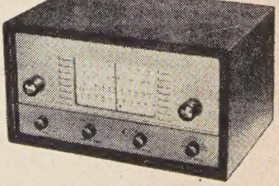
Here is a major Heathkit addition to the Ham radio field, the AT-1 Transmitter Kit, incorporaring many desirable design features at the lowest possible dollar-per-watts price. Panel mounted crystal socket, stand-by switch, key click filter, A. C. line filtering, good shielding, etc. VFO or crystal excitation—up to 35 watts input. Built-in power supply provides 425 volts at 100 MA. Amazingly low kit price includes all circuit components, tubes, cabinet, punched chassis, and detailed construction manual.

NEW *Heathkit* COMMUNICATIONS RECEIVER KIT



SPECIFICATIONS:

Range..........535 Kc to 35 Mc
12BE6 ....Mixer-oscillator
12BA6 ....I. F. Amplifier
12AV6 Detector—AVC—audio
12BA6 ....B. F. O. oscillator
12A6.......Beam power output
5Y3GT ....Rectifier
105-125 volts A.C. 50-60 cycles, 45 watts.



A new Heathkit AR-2 communications receiver. The ideal companion piece for the AT-1 Transmitter. Electrical bandspread scale for tuning and logging convenience. High gain miniature tubes and IF transformers for high sensitivity and good signal to noise ratio. Construct your own Communications Receiver at a very substantial saving. Supplied with all tubes, punched and formed sheet metal parts, speaker, circuit components, and detailed step-by-step construction manual.

MODEL AR-2

$25.50

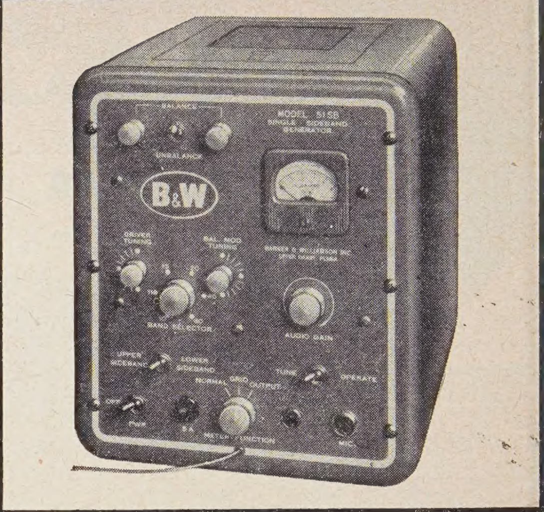
Ship. Wt. 12 lbs.

CABINET:

Proxylin impregnated fabric covered plywood cabinet. Shipg. weight 5 lbs. Number 91-10, $4.50.

HEATH COMPANY
BENTON HARBOR 6, MICHIGAN

HERE'S YOUR KEY TO SSB



Single Sideband Generator

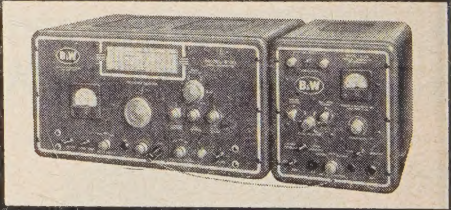
FOR B & W'S MODEL 5100 TRANSMITTER

Single sideband transmission, with its superior effectiveness over AM and its elimination of heterodyne interference, is yours with B&W's new Single Sideband Generator, Model 51SB. Used with the B&W Model 5100 Transmitter, this generator offers you:

- **SSB bandswitching operation on 80, 40, 20, 15, 11, and 10 meters**
- **150 watts input on SSB and CW, 135 watts on AM phone**
- **VFO or crystal control on AM, CW, and SSB**
- **Voice control operation on SSB**
- **Speaker-deactivating circuit**
- **Completely self-contained — except microphone**
- **Simple to install**
- **No test equipment required for installation or operation**

The Model 51SB Single Sideband Generator converts a B&W Model 5100 into a band-switching single-sideband suppressed-carrier transmitter—with all the advantages of SSB plus the AM and CW features already built into your Model 5100. Its construction is completely unitized. Equipment removes easily and disassembles into three major sub-assemblies: the R-F Unit, the Audio Unit, and the Main Chassis Unit.

Factory wired and tested, the 51SB comes to you complete with tubes—all set to convert your Model 5100 Transmitter to SSB. This combination provides a superlative driver for *any* high-powered linear amplifier! Write for descriptive Bulletin 51SB.



Information regarding the application of the Model 51SB Single Sideband Generator to other composite transmitters having certain required characteristics will be made available in the near future. Send name and address for Bulletin SBC.

B&W **BARKER & WILLIAMSON, Inc.**

237 FAIRFIELD AVE. • UPPER DARBY, PA.

A Very, Merry Christmas . . .

A Ham's Christmas

'Twas the Night before Christmas, and in the Ham shack
Was the warm glow of tubes in the transmitter rack
The logbook was brought up to date with great care
In case the FCC might someday be there.
XYL and harmonics were snug in their beds
(No Tennessee Indians to addle their heads)
I plugged in the mike and my new VFO
Getting all set for a nice QSO
When from the relays there rose such a clatter
I yanked the big switch to see what was the matter.
Then up on the roof by the two-meter beam
There came QRM like a heterodyne scream:
"On Gonset, on Babcock; On Viking and Elmac!
On Ranger, on Collins! On Heathkit and Eimac!
Bias to the grid and volts to the plate,
Just watch that S-meter while we all modulate!"
As I turned to the rig and reached for a dial
From the antenna tuner Santa slid with a smile.
An RF choke he held tight in his teeth
And coax encircling his head like a wreath.
A bundle of Hamgear he had flung on his back—
Was that my name on a new power pack?
He had a stub nose like an egg insulator
And his cheeks glowed bright red like a hot oscillator.
He spoke not a word, but went straight to his work
Laying out all the gear, then turned with a jerk
And, laying a wavemeter alongside his nose
Said "Pse QSL?" and up the feeders he rose.
He climbed up the dipole, to his team gave a whistle
And away they all flew like a jet-propelled missile.
But I heard his last signal from the ionosphere:
"Seventy three; Eighty-eight! And a Merry Xmas!"

Walter A. Tompkins, K6ATX

. . . From the Staff of CQ


K6AFL
K6ANN
K6BAS
K6BCM
K6BJ
W6AY
W6BAX
W6BET
W6BMU
W6CBN
W6CEO
W6CHE
W6DJI
W6DUW
W6DVB
W6DWM
W6FBR
W6FKS
W6FYM
W6HB
W6HHN
W6INJ
W6JFV
W6KEV
W6KFQ
W6KM
W6LOX
W6MUC
W6NBD
W6NGP
W6ODT
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W6WC
W6WSL
W6YSX
W6ZGV
W6ZLB
W6ZPH
W7SLC
WØIJC/6
W1KKP
W2CN
W2KSP
W2QA
W4AGD
W7ESK
W4TO
W6QD
W6ENV
W6JBC
W9AIO
W9DZY
WØNWW
WØRPE
WØAZT
Eimac
TUBES
HOLIDAY GREETINGS
from the
EIMAC GANG

zepp ? T2FD ground plane

Common Sense ANTENNA DESIGN

Yagi WINDOM ? POLE 3-el Rhombic ? ?

Robert W. Schoening, WØTKX

Bob Schoening was a teenager when licensed in January 1935. Since then WØTKX has gathered in Class A (1936), Extra Class (1952) and FCC radar, telephone (first) and telegraph (first) licenses. His favorite bands are 20, 40 and 80 CW, plus 6 and 2 meter phone. A number of Ham awards have been presented to WØTKX and include DXCC, WAS, BPL, A-1 Opr. Club, Public Service, 6-meter "Project RASO" and area SS and CQ contest certificates. ne state of Nevada is needed to complete a 50 Mc. AS. Bob is not mobile at present. Likes to design uipment, but not too keen on building it up. Member of both the Minneapolis and St. Paul Radio Clubs. urrently employed as Supervisor, Radio Communicaons, Northwestern Television and Electronics Institte, Minneapolis, Minn. Home Address: 10040 Brookde Ave., Minneapolis 20, Minn.

om time to time, new antenna designs for h superior radiating properties are claimed, announced to the amateur fraternity—a p which, fortunately, is always searching something better. The "magic" of these ns is supposedly due to an unusual dimen- method of feeding, angle of inclination, ven (heaven forbid) a terminating resistor h hungrily consumes a portion of the power to the antenna. Since anything from the us "wet string" to an underground vertical radiate, the practical results obtained with antennas are often much better than theory t predict.

r loud signals on the lower frequency s, I advocate the use of a "multi-band" nna in conjunction with an appropriate tuning system. With this system properly adjusted, results should at least equal those obtained from carefully pruned single frequency designs. The flexibility and simplicity of construction offered by "multi-band" antennas should be attractive—especially to the newcomer concentrating on eighty and forty meters.

Radiation and Signal Strength

Signal strength is determined by many variables. The most important of these over which we exercise some control, are antenna size and location, transfer of power from the transmitter to the antenna, and transmitter power. The antenna dimensions are usually influenced by where we live: How high the trees (or other natural supports) are, what part of the lot offers a clear area for the flat-top span, and other uncontrollable factors. The effect of transmitter power on signal strength is 100% predictable, but not nearly so pronounced as many of us think. The difference between 1000 watts and 75 watts input (all other things being equal) will not be the difference between a "very loud" and a "weak" signal. It will tend to be the difference between "loud" and "louder," or "weak" and "weaker" signals, as other conditions dictate. This leaves one completely controllable variable which exerts tremendous influence on signal strength: Getting the transmitter's output into the radiating system. This area of adjustment and design is well worth the application of a great deal of time, effort, and imagination. Fortunately, it's inexpensive.

Directional patterns of low-frequency antennas used by the average amateur usually differ from reference book patterns, which are for ideal locations. Since directional properties are to some extent unpredictable, they should be important considerations only for special antenna designs. Vertical antennas, beams, and special systems for the higher frequencies are not covered in this article.

Your "flat-top" is the actual radiator, and its location should be carefully selected. Surrounding the wire is a storage area from which the radiated energy must be extracted. Trees, power lines, house wiring and plumbing, and other questionable conductors in this area may cause a considerable loss of radiated power. While it should run essentially straight throughout its length, bending and tilting (or otherwise detouring) the antenna to avoid running close and parallel to tree branches or metal objects is advisable when necessary. Bending and folding the flat-top merely to get additional length of wire, however, may actually reduce its radiation. Wires which may or may not slant, and are not over 25 to 40 feet high, frequently will outperform perfectly horizontal antennas at great heights, when used for ordinary low-frequency amateur communications. Flat-top length is not critical. In general, the longer a wire is, the more it will radiate. Chopping ten feet from a 140-foot radiator to make it resonate, for example, will reduce its performance.

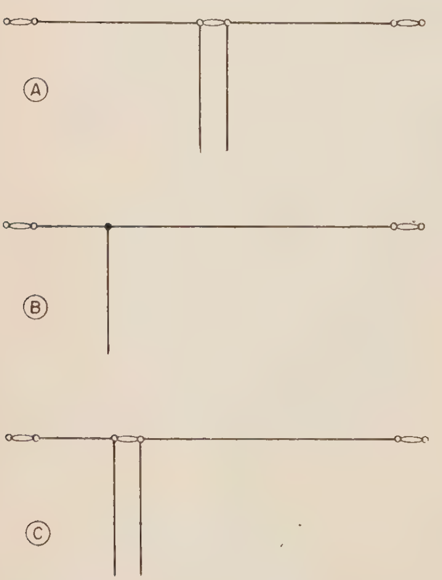


Fig. 1. Three of the most common and most useful methods of feeding a flat-top. As completely outlined in the text, the length of the flat-top is not as critical as many Hams have been led to suppose. Also, the exact point of feeding the antenna is not of really great importance. It should be determined by the position of location of the shack. The over-all lesson is to get as much wire into the air as practical.

Although the difference would not be nc able. Cutting off ten feet to keep the clear of foliage around a supporting tree w seem like a good idea. Antennas less than a 100 feet long tune critically in the lower quency bands, while those much over 200 long begin to develop directional characteri which may not be desired for general wo

Feeding the Flat-top

The flat-top may be broken with an insul at any point, and a two-wire feed line con ed. Alternatively, a single-wire feeder ma connected at any point along the antenna w out breaking the flat-top. Home-made two- transmission line using #12 to #18 wires plastic hair curlers or ceramic feeder sprea is excellent. Commercially manufactured o wire lines are often less expensive, but tr get the type made with "Copperweld" (such as *Buchan LL300* line manufacturec *WØTJF*). Solid dielectric TV type "twin-l costs almost as much, and is mechanically electrically inferior to open-wire lines; there its use is not recommended. Multi-band tennas using coaxial feedlines involve ren switching, or other design complexities. C is not suitable for working into the rang load impedances suggested here; but if the f line must run underground, through long m pipes, shafts, or ducts, or elsewhere in a m ner not applicable to open wires, special tenna designs will be required. At seven m cycles, there is no appreciable loss in either feet of badly mismatched, balanced open- line, or perfectly matched coaxial cable of flexible type. Badly mismatched co-ax, how will cause a noticeable reduction in si strength. The location of the "shack" in tion to the flat-top should influence your ch of feed system. Some common methods of f ing an antenna are shown in *Fig. 1.*

Figure 1a shows the balanced doublet, w tunes easily, has a non-radiating feed sy (possibly discouraging some types of TVI), has a somewhat more predictable radiation tern than any of the others.

Figure 1b shows the single-wire-fed ant which usually gives excellent results. Fee may be accomplished at any point, but w the feeder is tapped approximately one-s wavelength from the end of a half-wave flat this system is called a "Windom" antenna the feeder is tapped on either end, it is obviously a part of the flat-top—this is an fed" antenna.

Figure 1c depicts the "unbalanced doub If the feed-line is placed at the extreme (with one feeder open at the top) of a fla which is an integral multiple of a half this system becomes a "Zepp" with an a balanced feedline. The unbalanced double no particular advantage over the less-expe

single-wire-fed system for ordinary installations. Neither is as good, theoretically, as the balanced doublet; both are widely used and produce good signals.

Now, buy some wire and insulators, and hang up the sky-hook. Measure it if you like, though that will not necessarily help your signal strength. None of the dimensions shown in *Fig. 1* are critical. Use convenient and appropriate lengths, employ good mechanical construction, and make all electrical connections solidly and permanently. Observe the same precautions with the feed-line, especially if it is unbalanced, as with the flat-top. Keep the line short and direct, and a reasonable distance from the building, foliage, or metal masses; carefully insulate where it comes through the wall.

Earths, Grounds and Images

For any antenna system, the effect of the earth is as if a similar system existed like a mirror image the same distance below the actual ground that the radiator is above it. For single-wire feed systems, a connection must be made, in effect, to this "image." Often, when all of the large metal objects in the station (such as receiver and transmitter cabinets) are bonded together, their combined capacity to the earth will bring them near ground potential. Most units have power-line by-passes which parallel this capacity with a power-line ground. These effects in combination have enabled even single-wire-fed antennas to work with no actual ground wire, but this is a highly undesirable condition—the power-line by-pass capacitors are being used to feed some r-f energy into the line, although they are intended for just the opposite purpose. If it is impossible to ground your equipment with a short, direct, large size conductor to a good ground, try several wires of various lengths to different ground connections, tying all of them in parallel to the station ground.

In some installations—particularly "upstairs" shacks—a "cold" ground seems hopeless. This is particularly noticeable above seven megacycles where ground lead length becomes important, and below about 30 megacycles where stray capacity grounds begin to become effective. In these cases, the "hot" ground wire should be insulated with as much care as the antenna feeder. The transmitter and receiver chassis may then be connected to a "false ground." This is made with a single-layer coil having four or five times as many turns as the coils used to tune transmitter circuits to a given band, and having one end connected to the ground wire. The chassis are tapped on some "cold" point along the coil. The ground lead for single-wire-fed antennas, especially short ones, may carry considerable current. Getting a good low-resistance connection to the actual earth will be well worth while in these cases.

Figure 2 shows the schematic diagram of your transmitter as the antenna sees it. It is simply an a-c generator. Some transmitters have one output terminal grounded (such as those using co-ax connectors for output terminals). Other rigs (swinging link output types, for example) have neither terminal grounded, but in most cases, one terminal may be grounded if desired. Either type is generally designed to feed r-f power into a nearly "pure" (free from inductance and capacity effects) resistance of 30 to 500 ohms, unless otherwise specified in the manual accompanying commercially designed transmitters.

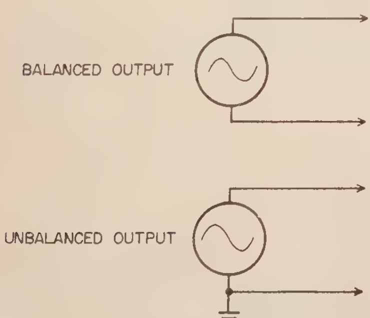


Fig. 2. Your transmitter as seen by the antenna.

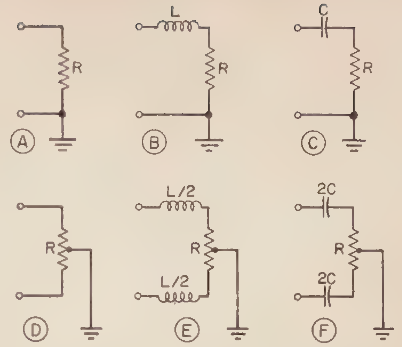


Fig. 3. These are the equivalent electrical circuits of single-feeder (A, B and C) and balanced (D, E and F) antennas. See text for details.

Equivalent Circuitry

Figure 3 shows the simplest equivalent electrical circuit of your antenna. *A, B,* and *C* are for single-feeder systems. *D, E,* and *F* are for balanced doublets. The equivalent circuits for unbalanced two-wire feed systems will resemble *D, E,* and *F* except that the ground point (shown, but not actually physically connected to the antenna) will not be at the electrical center of the network, nor will the inductance and capacity effects be equally distributed as shown. Which of the diagrams applies to your specific antenna may be determined by experiment.

The sizes of *L, C,* and *R* in the equivalent diagrams *(Fig. 3)* vary widely depending upon the antenna dimensions and transmitter frequency. The primary objective of an amateur station is to get power from the generator *(Fig. 2)* into the resistor portion of *Fig. 3.* If directly connecting the antenna terminals to the transmitter doesn't produce optimum results (it seldom will), either the resistance is the wrong value, or the effects of the equivalent inductance and capacity are too great. *L* and *C* can not absorb power themselves, but they can effectively keep it out of the resistor. By the way, the resistor shown is not the famous "radiation resistance," but is the "input resistance" for the antenna system. It is not essential to know its value, but relatively simple methods for determining resistance values at a given radio frequency have been described in *CQ*.[1]

The effects of the undesired inductance or capacity are nullified by using a resonant antenna tuner. Resistance values (for a.c.) are changed by using transformer action, readily obtained with a simple antenna tuner.

Why the Antenna Tuner

In addition to the two functions mentioned above, the antenna tuner will discriminate against the transfer of harmonics into the antenna, and against the associated menace of TVI.

A further characteristic which may be called the *"Q"* of the antenna tuner must also be considered. The three main functions of the tuner may be performed with different values of *Q*. If the *Q* is too high, however, power may be lost in the tuner; furthermore it may require too-frequent retuning as frequency changes are made within a given band. If the *Q* selected is too low, some harmonic attenuation may be sacrificed. It is better to err in the "too low" direction—indicated by very broad tuning of the tuner. This characteristic should not be confused with the *"Q* of the coil" which is a factor of merit, and should be as high as possible. The coil used with an antenna tuner must be wound with the largest convenient size of wire, and all connections should be well soldered, or be solid contacts between clean surfaces. Antenna tuning capacitors having the same plate spacing (voltage rating) as those in the transmitter's final amplifier plate circuit are usually adequate. Inductance and capacity values are usually similar to those used in the final amplifier. Manufactured inductors rated at less than 250 watts are generally unsatisfactory, even for low power levels.

Let's assume that the r-f energy is carried from the transmitter to the tuner through a low-impedance unbalanced transmission line, such as coaxial cable (with one side grounded). This "output line" should be no longer than n sary, since certain adjustments at the tune come more critical as the length of the lin creases.

Equipment essential for proper antenna ing includes a neon bulb. This will ind the presence and relative amplitude of r-f ages. Grounded points should, of course "cold" (no r-f voltage). Antennas which hibit a low impedance (voltage to current r are called "current fed," and little relativ dication of r.f. on the feeder(s) will be appa while "voltage fed" (high impedance) ante will cause the bulb to light brightly near feeder(s) when they are in operation. F given antenna, the most voltage obtainabl the feeders usually indicates the best opera but whether this "most" voltage is high or has nothing to do with the effectiveness of antenna.

Before attempting the adjustment of an tenna, it is well to connect the output en the transmitter output line to an ordinary watt lamp bulb, or other appropriate du load. An excellent discussion of the us light bulbs as dummy load resistors appe in a previous issue of *CQ*.[2] Operating into dummy, record all of the pertinent transm dial settings for normal full loading. The tings eventually used when working into actual antenna, should not depart apprec from these recorded readings.

When making adjustments, it is necessa radiate a signal which may cause interfer If possible, reduce the final amplifier plate age (also the screen voltage, in the same if the tube has a screen grid) during ad ment. A plate current which is the same centage of normal full-load operating cu that the reduced plate voltage is of the plate voltage, may be considered full-load rent when operating at reduced power. power reduction will seldom prevent muc terference, so do your testing on a clear nel—never during busy operating periods listen frequently, signing your call at th quired intervals.

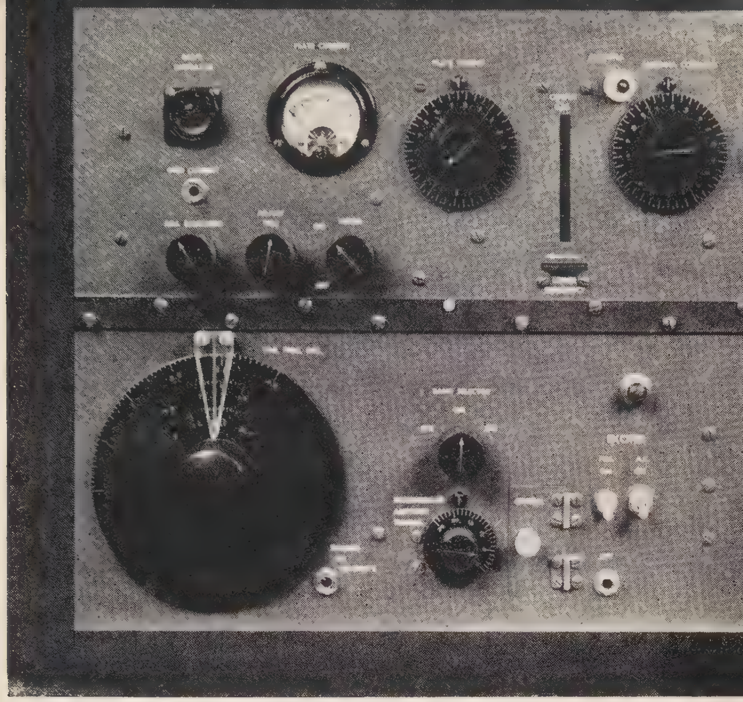
Antenna Tuner Design

Figure 4 shows some of the possible ci for antenna tuning. *Figure 4a* is for unbala antenna systems with single-wire feed, an is for two-wire feed systems. *4b* and *4d* ar respective alternative systems called "capa coupling." Capacitive coupling gives sup harmonic attenuation, as well as a smo range of adjustments, but the initial desi more critical. The antenna tap *"Z"* for systems is effectively varied from a high vo

1. William I. Orr, W6SAI, "The Matchmaker" CQ, Dec. 1951, p. 27.

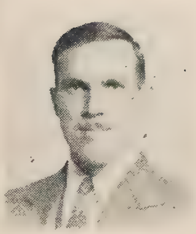
2. John J. Nagle, W3JES, "Power and Resistance R of Incandescent Light Bulbs," CQ, Jan. 1951,

[*Continued on page 60*]



My "FINAL" EXCITER

Carlton G. Rich, W8ZYG



W8ZYG became interested in Ham radio during his high school days but did not become licensed (as W9STU) until 1941. After a war time stint in the Merchant Marine, he moved to Port Huron and took a Class A. The principal interest at W8ZYG has always been building and tinkering with equipment rather than actual operation. However, 40 and 80 are his favorite bands. In 1951, Mr. Rich was appointed head of communications in Port Huron's Civil Defense organization. He also attended the FCDA Staff College in Olney, Md. W8ZYG is employed as an inspector in the U.S. Immigration Service. Home Address: 3318 Stone Street, Port Huron, Mich.

We moved recently—to a brand new location, with brand new, polite, friendly, *neighborly* neighbors—and I just didn't have the heart to set up the old rig. Most of our new-found friends' houses sport tall TV masts, for adequate fringe-area reception of the Detroit stations 60 miles away. Compounding the problem was the fact that the channels in use are 7 (not so bad), 4 (a little worse), and 2 (terrible!). The old rig definitely would not do. Even at the old location it attained such notoriety that the kids couldn't stroke the family cat on dry days without precipitating a prompt jangling of my phone.

The exciter described below seems to be the answer to this particularly ticklish TVI problem. Even with its final amplifier it can be operated right in the same room with the TV set without causing any detectable interference.

The evolution of a really adequate solution to the TVI problem produced a few very welcome bonus features. The "crystal-controlled" v-f-o-exciter turned out to be a versatile unit.

With the insertion in the crystal oscillator socket of a Ham-band crystal, it becomes a straight-through crystal exciter. With the insertion of the proper heterodyne-frequency crystal in the socket, it becomes a v-f-o exciter. In either case, keying is crystal-clear, for only the crystal oscillator circuit is keyed. In the unit here, a single crystal covers 80 and 20 meters, with a second crystal covering 40. Stability is excellent, dial-*spread* is uniform on all bands,

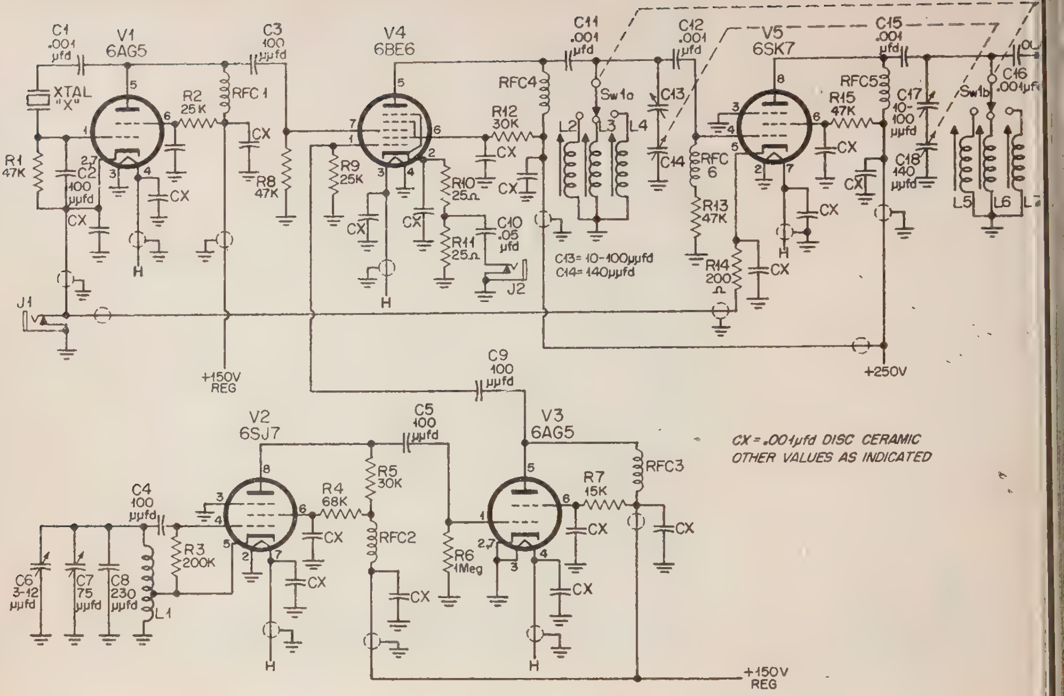


Fig. 1. Parts list and wiring diagram of the heterodyne multi-band v-f-o unit.

and the parts are inexpensive. All tubes are standard receiving types.

How were the problems of harmonic-rich multiplier stages solved? By the easiest way—avoidance. No multipliers.

But isn't it a multi-band exciter? Yes.

And is there no stability problem? Yes, there is *no* stability problem. The variable-frequency oscillator operates in one range, relatively low in frequency, chosen for optimum circuit conditions, stability and simplicity.

How does it sound on CW? Crystal-clear, because the variable-frequency oscillator remains isolated and undisturbed. A voltage-regulated crystal oscillator is the stage keyed. The v.f.o. runs continuously on CW, but produces no interfering signal in the receiver when the key is up, because it operates outside the band. And the keying is just as clean on the highest-frequency range, for there is no multiplication of minute variations in the oscillator's output frequency. This means that if NBFM is incorporated, the deviation control will require no readjustment with a change in bands.

Also, the bandspread on the highest band is not cramped, but is the same as that on all the bands. 100 kc. on any band covers the same number of degrees on the dial.

Would this be a good rig for the Novice? Yes, since it can be used as a straight-through crystal oscillator by simply plugging the desired Ham-band crystal into the crystal socket. The v.f.o. tube need not even be in the circuit and the Novice could ignore this part of the circuit until he is ready for general class operation.

C1, C11, C12, C15, C16—0.001 µfd., mica.
C2, C3, C9—100 µµfd., mica.
C4, C5—100 µµfd., zero-temperature coefficient ceramic.
C6—3-12 µµfd., ceramic trimmer.
C7—75 µµfd., variable.
C8—Parallel combination of zero-temperature coefficient ceramics to equal 230 µµfd.
C10—0.05 µfd., tubular, 400v.
C13, C17—10-100 µµfd., ceramic trimmer.
C14/C18—140 µµfd., dual variable, Hammerlund HFD-140.
Cx—0.001 µfd., ceramic disc condensers, 18 required.
J1, J2—Closed circuit phone jacks.
L1—17 turns, #16 on grooved ceramic form, 1¼" dia., space wound by wire diameter. Tapped at 6th turn.
L2, L5—44 turns, #24 enam., closewound o ½" dia., plastic form with adjustable iron slug.
L3, L6—22 turns, #24 enam., closewound o ½" dia. plastic form with adjustable iron slug.
L4, L7—12 turns, #24 enam., spaced over length on ½" dia. plastic form with adjustable iron slug.
R1, R8, R13, R15—47,0 ohms, ½w.
R2, R9—25,000 ohms, ½w.
R3—200,000 ohms, ½w.
R4—68,000 ohms, ½w.
R5, R12—30,000 ohms, ½w.
R6—1.0 megohm, ½w.
R7—15,000 ohms, ½w.
R10, R11—25 ohms, ½
R14—200 ohms, ½w.
RFC1 RFC2, RFC3, RFC4, RFC5, RFC6— mh., 100 ma., r-f choke.
Sw1—Two-gang ceram insulated tap switch.

How many tuning controls on this excite Two. Set the main dial to the desired frequenc then peak the output control for maximum gr drive of the final amplifier stage.

The heterodyne principle is not new. Near every amateur receiver uses a heterodyne fr quency converter. Some single sideband tran mitters utilize the principle. But its use in co ventional transmitters is practically unknow

and ignorance of the virtues of such use in this age of TV and more exacting standards is vast. Not quite abysmal, but vast. And it is *so* simple.

The Heterodyne Circuit

Mathematically, the rig is simple, involving only addition or subtraction. No multiplication.

The output is either the sum of or the difference between two frequencies generated by a crystal-controlled oscillator and a variable oscillator, whose outputs are run through a mixer tube and then amplified. The variable oscillator always operates over the same band of frequencies, outside any Ham bands, so it can run continuously, thus minimizing drift. Yet during "standby" or "key-up" periods, it does not put an interfering signal into the receiver. The different Ham-bands are reached by plugging in appropriate crystals, and selecting the desired sum or difference frequency in the gang-tuned mixer and buffer stages. Thus no harmonic-generating multiplier stages are necessary. This feature, and the use of low power throughout, are the reasons why harmonic output is negligible.

In planning the exciter, much adding and subtracting of possible crystal and v.f.o frequencies was done in attempting to derive amateur-band heterodyne signals from a circuit fulfilling these requirements:

1. The variable oscillator should run at a reasonably low frequency, in the interests of stability.
2. Neither oscillator should operate close to any Ham band, since the output tuning might not be sharp enough to prevent some amplification and radiation of the oscillator's signal outside the bands.

These requirements conflict somewhat, and a compromise is necessary. For example, it would be nice to hit 3500 kc. by using a 2500-kc. crystal and setting the v.f.o. at 1000 kc. But to hit 14,000 kc. with that same dial setting, a 13,000-kc. crystal would be needed, and probably some of the 13,000-kc. energy would get to the antenna. It certainly would if any attempt at broad-band tuning were made.

In this unit, the final decision was to use a v.f.o. range of 5000 to 5500 kc. With a 9000-kc. crystal in the socket the difference frequency yielded by mixing the outputs of the two oscillators would be from 4000 to 3500 kc. The sum of the frequencies 9000 and 5000-to-5500 kc. yields a heterodyne signal from 14,000 to 14,500 kc. Thus we get coverage of 80 and 20 meters with one crystal.

A war surplus 1950-kc. crystal provides 40-meter output from 6950 to 7450 kc. However, now note that on 80 the dial reads backwards as compared with 40 and 20. A real purist would buy another crystal ground to 1500 kc. and then on all three bands the frequency would increase with clockwise rotation of the dial.

80, 40, and 20 meters were the only bands used in this unit, although the principle may be used on any bands desired. There is no magic in the particular frequencies used here. The prospective builder can devise many combinations of crystal and variable oscillator frequencies that will work well in a unit like this. There are still available a number of war-surplus crystals that can be used, bearing in mind the above-mentioned basic requirements. Most surplus crystals are ground to odd frequencies, so that the band edge and kilocycle marking on the dial may not coincide for the various bands.

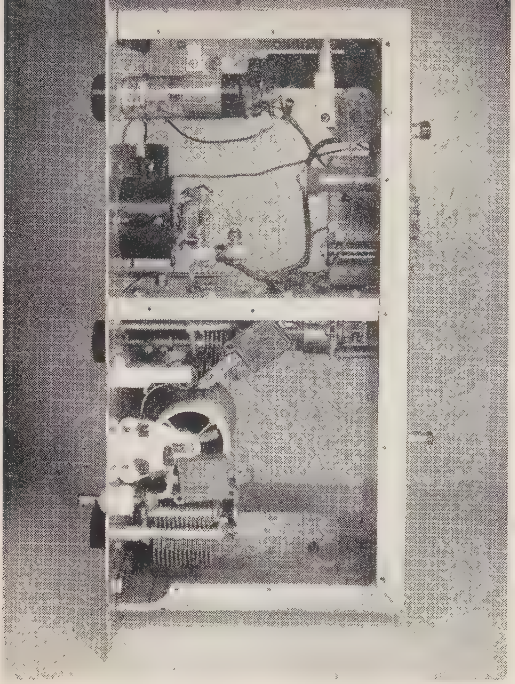
One drawback might be the seeming complexity of the circuit. Five tubes are used, but there is nothing intricate about any of their circuits, as a glance at *Fig. 1* will show. *V1* is a simple 6AG5 crystal oscillator circuit, and *V2* is a conventional Hartley v.f.o., foolproof and easy to adjust. *V3* is the untuned v-f-o buffer, *V4* is a conventional pentagrid mixer, and *V5*, a tuned buffer-amplifier. Individual slug-tuned coils simplify the tracking of the output stages over the various bands. Output on 20, 40, and 80 is just a little more than enough to drive a 6146, or similar tube. Those are the bands which interest the author, and the other bands were left out primarily because of space limitations in the cabinet. There seems to be no reason why it could not cover other bands such as 160, 15, and 10, given suitable crystals, sufficient space, and enough positions on the band-change switch.

In the original unit an attempt was made to use pi-network coupling between stages and to suppress harmonics through loose coupling and the by-pass effect of the output capacitor. This accounts for a few of the unused holes showing in the pictures. While this theory is undoubtedly correct, since there appeared to be no appreciable harmonics, the coupling was so loose that the exciter did not have the required output. The pi-network confused the tracking problem, too.

Fortunately, it was found that the pi-network coupling was unnecessary, and the conventional coupling method shown in the circuit diagram was adopted.

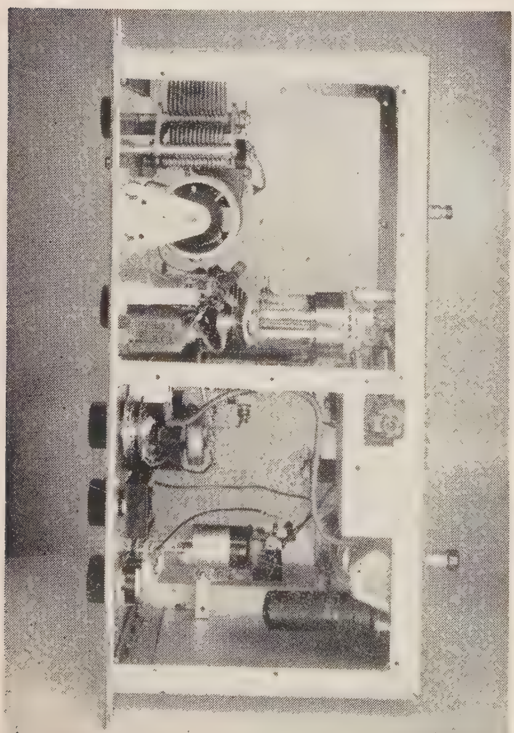
Construction

As shown in the photographs, the exciter and final are built into two surplus BC-375 tuning unit frames, with the exciter in the lower unit. On the left is the v.f.o., in its own compartment and built on the cover of a surplus jack-box which is bolted to the end wall like a shelf. A trimmer, *C6*, is provided to keep the dial marks accurate as the years roll on, tubes are replaced, etc. It can be adjusted with a screwdriver through a hole in the rear of the case. The main dial is a planetary type taken from a BC-375 tuning unit. A 6″ aluminum disc replaces the smallish numbered part of the original dial assembly. All the dials were painted black and the marks put on with dime-store aluminum paint and an ordinary pen. The calibration



Above: View of the final amplifier stage with the top panel removed.

Below: Looking into the bottom of the final amplifier.



was done with the v-f-o trimmer at half-capacity so correction can be made for drift in either direction. Normal precautions were taken to do a good job of mounting the v.f.o. parts solidly. The oscillator coil was wound on a ceramic form, grooved to minimize wire movement. The variable condenser has good bearings and no play in the shaft. Any necessary shaft extension should be made of brass or aluminum, so the set screws can bite in to prevent slippage. There isn't too much heat generated by the tubes, but fairly thorough ventilation should be provided.

The untuned-buffer tubes run continuously with the variable oscillator and isolate it from keying effects. It will be noted that the 6SK7 output tube is keyed with the crystal oscillator, via jack *J1*, because with the key open there is little grid bias to hold its plate current down.

The crystal oscillator is well shielded and shares the front center compartment with the mixer tube. This is to keep the crystal signal from going anywhere but to the mixer grid. The oscillator components and wiring are housed entirely within a jack-box, the open end of which faces the front panel, while the open side is closed by the partition shielding the power supply section. Even the crystal is inside, with access to it through a door in the front panel, although this degree of precaution is probably unnecessary.

The 6BE6 mixer tube is tucked in the corner of the front compartment near the v.f.o. and the 6SK7 amplifier is isolated in the rear compartment. The dividing partition shields the two stages from each other. The dual tuning condenser and 2-gang band switch project through the partition, and are mounted on brackets made from ¾″ x ¾″ aluminum stock. Liberal use of these aluminum angle brackets is made throughout the chassis.

Ample shielding, rigid mounting of parts and use of short leads are primary considerations in the layout of this chassis. Liberal use of shielded hook-up wire and .001 μfd. bypass disc ceramics, as shown in *Fig. 1,* is advised. Sheet copper is used for practical, not aesthetic reasons. The tubes and their relative components were mounted and wired on individual sheet copper sub-assemblies, with all ground connections made by soldering to the nearest point on the copper. Then the various sub-assemblies, tuning condenser grounds, coil grounds, etc. that carry r.f. were connected by copper sheet or straps as wide as possible, with all joints soldered. Thus we need not depend for conduction of r.f. upon aluminum, with its bolted joints and possibly poor connections. The sheet copper is soft, easily-worked roof flashing material, obtained from a lumber yard. As it quickly conducts heat away from the soldering iron it is better wherever possible to do the soldering to the copper before it is bolted to the cold aluminum.

The dual tuning condenser, *C14-C18,* is a *Hammarlund HFD-140,* chosen for its suitable dimensions. To reduce its effective capacity, and to provide a convenient means of adjusting the tuning rate and range of the condenser, the series trimmer condensers *C13* and *C17* were installed. An *HFD-100* or similar condenser might be used, and *C13* and *C17* could be eliminated.

The slug-tuned forms used were surplus items. The awkward mounting flanges were cut off and the forms were cemented into ½″ holes drilled in a ¼″-thick sheet of clear plastic. A commercially-available ½″ diameter slug-tuned form should work just as well.

Assembly

The exciter power supply, *Fig. 3,* is included in the exciter chassis shown here. This was installed first. Next the two oscillators were assembled, mounted in place, and tested. Then the remaining two partitions, the one behind the dial and the one parallel with the panel, were made, fitted in the case, then removed, still fastened together and forming a "T". All the 6BE6 and 6SK7 mounting and wiring, including the bandswitch and tuning condenser, was done on the T-shaped assembly before it was mounted permanently in the case. Then all that remained was the power, input, and output wiring.

Output from the exciter was originally fed through a short length of co-ax, but when it was decided to mount the final amplifier above the exciter the co-ax was discarded because its capacitance acted as a by-pass across the output, even though its effect was minimized by the large capacitance as *C16.* To achieve tracking, a matching capacitance was required across the mixer output and the *C/L* ratio was higher than wanted. Now the output signal travels up a short piece of stiff copper wire directly to the grid circuit of the 6146 in the upper unit. The connection is made by a phone-tip jack mounted in the bottom of the upper unit so the wire plugs into it. If a builder wants to use co-ax to an amplifier some distance away he should remember either to provide a balancing capacitor and to adjust the coil turns accordingly, or to use link coupling.

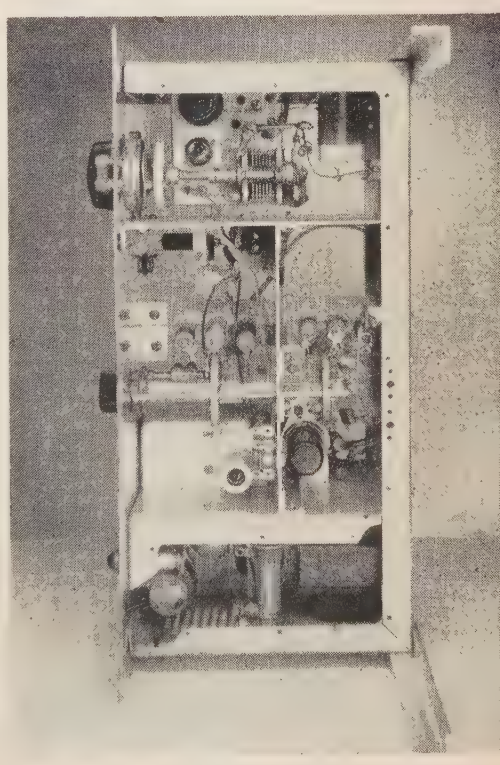
Tuning and adjustment of the completed exciter unit requires only two, or even one, voltor milliammeters, and the station receiver plus whatever frequency-metering equipment is available for calibrating the v.f.o. dial.

Calibration

The 5000-kc. band-edge point can be spotted by zero-beating with WWV. Phone jack *J2* is then utilized in calibrating the v.f.o. If any crystals can be found whose frequency falls within the range covered by the v.f.o. they may be plugged into the crystal socket and with earphones plugged into *J2* an audible beat note will be heard as the v.f.o. dial is brought near

Above: View of the exciter portion as seen without the bottom plate.

Below: A top view of the exciter.



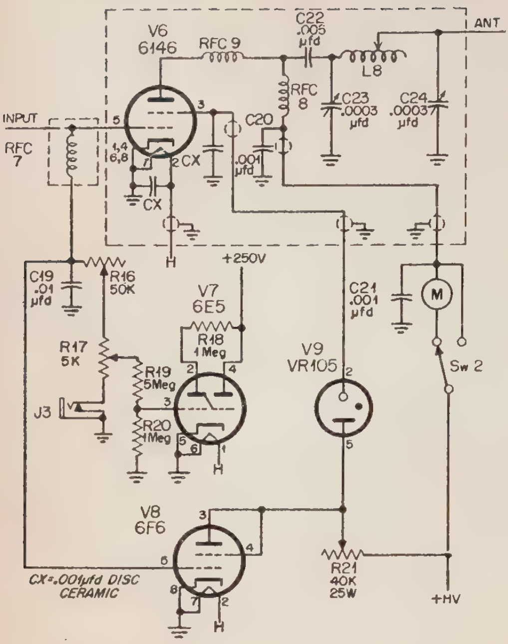


Fig. 2. Final amplifier used by the author.

C19—0.01 µfd., mica, 400v.
C20, C21—0.001 µfd., 2500v. test.
C22—0.005 µfd., 2500v., test.
C23, C24—300 µµfd. (approximate), variable.
J3—Closed circuit jack.
L8—Roller-type variable coil assembly from BC-458 "Command" transmitter, or equivalent.
R16—50,000-ohm wire wound potentiometer.
R17—5000-ohm wire wound potentiometer.
R18, R20—1.0 megohm, ½w.
R19—5.0 megohm, ½w.
R21—40,000 ohms, 25-watt, wire wound, adjustable.
RFC7—2.5 mh., 100 ma., r-f choke.
RFC8—2.5 mh., 200 ma., r-f choke.
RFC9—Ohmite Z-1 r-f choke.

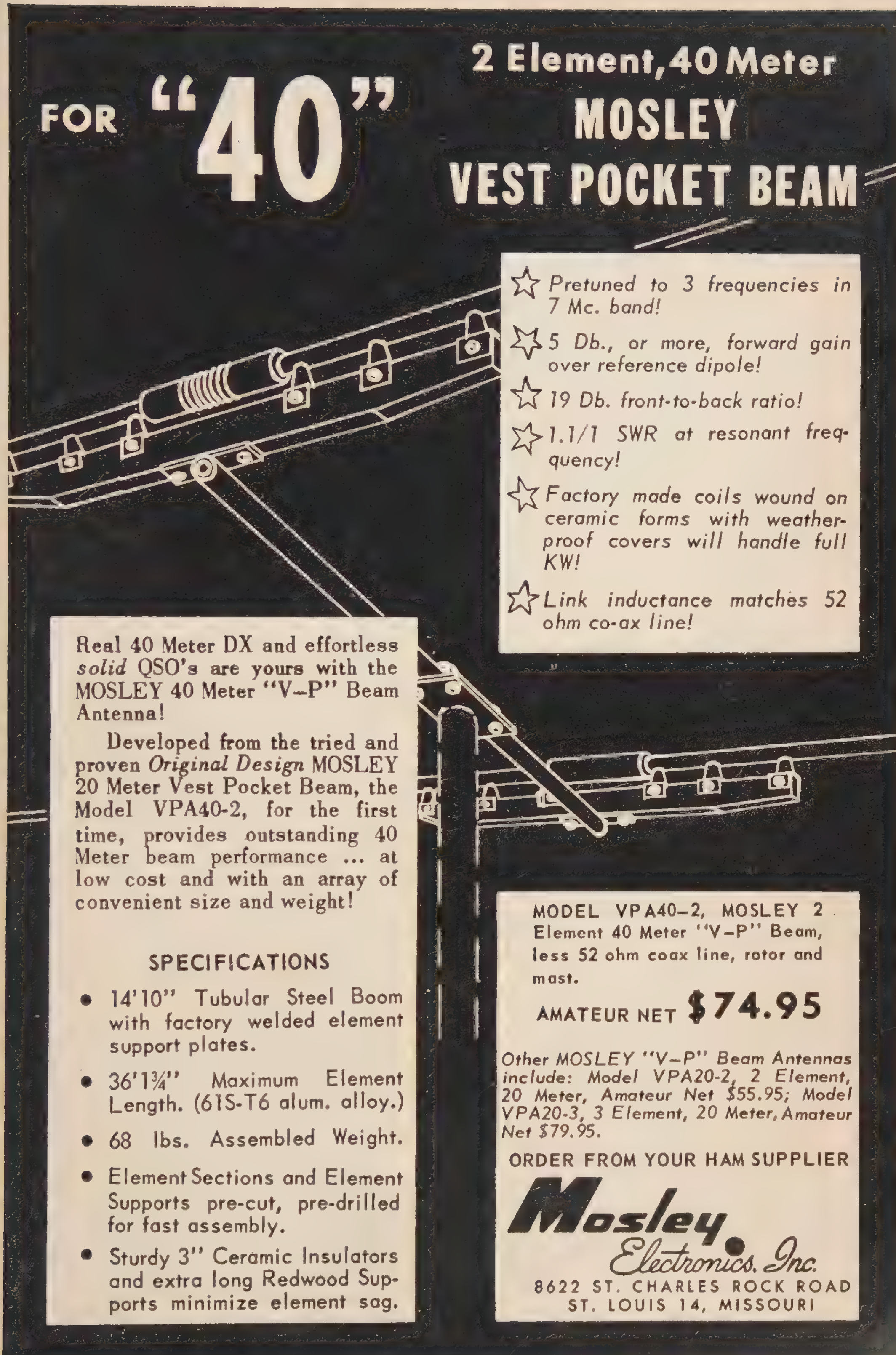
the crystal's frequency. At zero beat the v.f.o. is exactly on the crystal frequency A crystal whose harmonic falls within the range will also work similarly. Any such check point makes a good place to start counting off the kilocycles, if a frequency standard or other calibrating device is available. The author used a 1000-100 kc. crystal standard and its 10 kc. multivibrator. Its output was fed into the exciter crystal socket at point "X" on the diagram—a direct connection to the grid of *V1*. The previously mentioned beat notes—at zero beat—provided the dial calibration marks. The beat notes are not loud and the ones marking the 10 kc. points were so faint that a small audio amplifier, instead of earphones, was plugged into *J2*. The 100 kc. points are readily identified by their loudness, so there is little chance of making an error in the count. Another way of finding the dial points is by listening on the station receiver for the beat note produced by the v.f.o. and the crystal calibrator, but this has its disadvantages. Both v.f.o. dial and receiver must be tuned to each new 10 kc. check point, and the receiver may pick up other signals, making it difficult to determine which is the one wanted, unless the local signal is interrupted or modulated for identification.

The 6BE6 and 6SK7 stages are of course tuned to the Ham bands and can be adjusted by using the beat note from both oscillators or the signal from suitable Ham-band crystals in the crystal socket. Connect a voltmeter across, or a milliammeter in series with, the 6SK7 grid resistor *R13*. Adjust the coil slugs *L2, L3,* and *L4* for band coverage and maximum meter reading on each band. Next do the same with the output coils *L5, L6,* and *L7,* with a meter in the grid circuit of whatever final amplifier is used. In the author's 6146 final, *Fig. 2,* the measuring is done at *R16- R17*. Measurements are made, of course, with the final filament on and the plate voltage off. The readings will be considerably higher than with the final plate voltage on, up to 5 ma. or 80 to 90 volts, depending upon the grid-circuit resistance of the amplifier used. It is a little easier if two meters are used together, one for each grid circuit. Next, touch up all the adjustments at both ends of the bands, until the tracking is uniform. The L and C of the two resonant circuits is virtually identical, with similar settings of *C13* and *C17* and the tuning slugs of corresponding coils, so it is not difficult to get the circuits tracking evenly. Whatever differences in reactance which are presented by the final grid circuit used are compensated for by adjustment of *C17,* if trimmers *C13* and *C17* are used, or by the tuning slugs of *L5, L6, L7* if these trimmers are not included in the circuit. If the two trimmers are used, they can be set to spread the 80-meter band the desired number of degrees on the dial, and the tracking can be adjusted more precisely.

The Final Amplifier

The final amplifier, *Fig. 2* is conventional except for the addition of a tuning-eye in the grid circuit. With a view to obtaining optimum bias, a variable 50,000 ohm control, *R16,* was inserted as the grid resistor. *R17* also contributes to the bias, but its purpose is to set the negative voltage on the tuning-eye grid. With it the eye can be adjusted to close to a fine line at maximum excitation so that any de-tuning of the exciter output will show as a broader shadow. It works very well and makes a fine substitute for a grid meter. It is cheaper, doesn't wear out with keying, and gives visitors something to look at. It "winks" with keying, of course. A closed circuit jack, *J3,* is provided so a meter

[*Continued on page 52*]


FOR "40"
2 Element, 40 Meter
MOSLEY
VEST POCKET BEAM
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1.1/1 SWR at resonant frequency!
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DX and Overseas News

Gathered and reported by

R. C. "DICK" SPENCELEY, KV4AA

Box 403, St. Thomas, Virgin Islands

As the year draws to a close we again salute the efforts of the following stations who, via the expedition or activity route, were instrumental in giving many of us a "new one" for 1954:

- Aland Islands: OH2ZE/OHØ, OH2LX/OHØ (Not separate as yet).
- British Somaliland: VQ6LQ (ex-ZD1LQ).
- Clipperton Island: FO8AJ (WØNWX, WØNUC, WØVDQ).
- Cocos Island: TI9AA (DI9AA).
- Corsica: F8FW/FC (HB9LA, HE9RDX).
- Crete: SVØWK/9 (SVØWK/K6AUU, SVØWL/W6ZID).
- Dutch New Guinea: JZØKF (ex-PJØX).
- Easter Island: CEØAD.
- Fanning Island: VR3D/VR3A (VK2ANB).
- Formosa: AB1US (Probably will be acceptable).
- Gambia: ZD3BFC (G3BFC, ex-VQ6BFC/MT2BFC).
- Heard Island: VK1DY.
- Jan Mayen Island: LB8YB.
- Jordan: ZC7DO, ZC7BB, ZC7AM.
- Kerguelen Islands: FB8XX (ex-FB8ZZ).
- Liechtenstein: HB1MX/HE.
- Macquarie Island: VK1AC (VK3ACI).
- Navassa Island: KC4AB (W4VZQ, W4QCW, WN4HBC).
- Norfolk Island: VK9OK (VK2AOK, ZL1AJU), VK9RH.
- Qatar: MP4QAH, MP4ABW.
- Reunion Island: FR7ZA.
- Rio de Oro: EA9DE (EA2CA), EA9DF.
- San Andres Island: HKØAI, HK expedition of May 1954.
- Sarawak, Brunei, Borneo, Grenada B.W.I.: VS4RO, VS5RO, ZC5RO, VP2GRO (G2RO).
- Sarawak: VS4HK (ex-ST2HK).
- Tokelau Island: VR2BZ/ZM7.

At Time of Writing

G2RO/PACIFIC ISLANDS: Thanks to the West Gulf DX Bulletin, G2MI and W4CEN, we are advised that G2RO was due to leave England on or about October 15, for his scheduled tour to the Pacific areas. Bob will go via the U.S.A. and Honolulu.

Presently known stops are as follow:
VR2RO, Fiji Islands: Nov. 4 to 17
VR4RO, Solomon Islands: Nov. 22 to Dec. 7
VR1RO, Gilbert & Ellice Islands: Dec. 30 to Jan. 10

Arrangements for a visit to VR5RO, Tonga, are pending and, if we know Bob, efforts will be made to put 2RO on the air from any rare spot within walking distance. He will return to England via Australia, Cocos, Mauritius and Africa and will, no doubt, operate from each of these spots for short periods. All QSL's from Bob's Asian tour should be in your hands by Xmas and if any are missing please send another QSL to him, via RSGB, with the word "recheck" prominently displayed.

SVØWK/9, CRETE: A recap on this expedition, Sept. 5 to 8, shows that 471 contacts were made in 58 countries over a 64-hour operating period. First contact was with F8PQ and the last one, I1BPW. First W on both phone and CW was W8PQQ. First in the W districts were; W1HA, W2EGW, W3JNN, W4FU, W5JUF, W6SYG, W9FID and WØAZT. No W7's were heard and a total of 81 W's were worked. European QRM limited stateside contacts. OK1MB deserves a vote of thanks for his efforts towards keeping the frequency clear. 21 Mc. was a "bust" with only 3 contacts being logged. All QSL's should be out.

VQ6LQ, BRITISH SOMALILAND: This station continues his substantial efforts to contact W's with considerable success. His operating times seem to center around 1600 and 2200 GMT daily and in addition 1200 GMT, on Saturdays. QRG is from 14050 to 14072. Charles runs an ET-4336 rig at 300 watts and the receiver is a BC-794. We hear that the rig is some three quarters of a mile from the operating position which "makes" for break-in. W2PRN claims to be his first W contact. VQ6LQ is an operator with Posts and Telegraph in Hargeisa and cards go to Box 11. We hope the QSL's will flow more freely than during his stay at ZD1LQ.

FE8AN, FRENCH CAMEROONS: This station, ex-FF8AN, should be on the air around the first of January according to F9RS. His QTH is: Marcel Veber, Box 408, Douala, Cameroons, F.E.A. Power 50 to 100 watts, CW, with phone later.

DX Notes

It appears that **VQ4HJP** has sold all his gear and retired to Mafia Island. This spot is south of Zanzibar and might qualify as a "separate" one. At any rate pressure is being put on him to return on the air with a possible VQØ prefix. . . . Via the West Gulf DX Bulletin we learn that anyone lacking QSL's for HA contacts is invited to write, via registered mail, to Banszegi Ferenc,

Last minute DX items are featured on page 4

HA7PC, Central Radio Club, Postbox 185, Budapest 4, Hungary. . . . **HS1D** is slated to leave Thailand in February. His next berth will be Pakistan or Spain. . . . Bari, **VR2BZ/ZM7**, writes that he had no idea that such importance would have been attached to his Tokelau trip. After reading the FO8AJ story he now gets the idea. Great efforts will be made to have a more effective transmitter and receiver along with him for the next trip (which we hope materialized in November). His aim is to dish out QSO's to the many who were disappointed during his first trip. ZM6AR was one of the official party, during VR2BZ/ZM7's stay, and he used the station at Nukunono to contact three ZM6 and one ZK1 station on 7-Mc. phone using the call of ZM7AA. We now hear the call of **ZM7AA** has been officially given ZM6AR and we look forward to activity from him in the future. . . . ZS9I reporting activity in Bechuanaland, via letter to W9IOP, says that Ted, ex-ZS6AHP, and XYL will be heard from in their new QTH of Francistown shortly as **ZS9M** and **ZS9N** respectively. Jock, ZS9A, runs 25 watts phone on 7 and 3.5 only while Mac, ZS9H, also phone, has moved to Lobatsi. Dave, ZS9G, another phone addict is brushing up his extremely distant acquaintance with the works of Samuel B. Nev, ZS9I, should have been heard in the recent contest on all bands from 80 to 15 with 100 watts. . . . A Monaco card to W5FXN said: "Sorry no 3A2AY operation this trip. Got married Tuesday, 73 (sig) **G6LX/3A2AY**. Nuff sed —but don't forget the rig next trip Ron. . . . G4CP reports on ZC7 activities as follow: **ZC7DO** is QRT and has left the Army due to poor health. QSL's disappointing. **ZC7BB** should be back in England now. Left to carry on is **ZC7AM**. . . . Bob, W4QCW, states all **KC4AB** cards to contributors should have been cleared in October. Others will follow via bureaus. Bob has been QRL college.

Here is Ted Beyer (SVØWL/W6Z!D) hard at work holding down the CW end of SVØWK/9 during the recent trip to Crete with SVØWK.

From the Southern Calif. Bulletin we hear that the VK1's on Cocos are due to pull out in October. Word from Ceylon says that **CR8AB** is real QRS even lets S9 signals go by. **FM7WN** plans vacation in FG7 and will advise forthcoming dates of operation. **FW8AB** may be heard quite frequently 0300-0600 GMT, 14080. . . . Pete, 4S7XG (G3HVG), is now home and passing some time with G8VG. . . . Via FOC-CL we hear that VQ4EI's trip to Zanzibar, where he appeared as **VQ1DT**, was rewarded by exactly 4 QSO's: G6ZO, ZC4RX, VQ2GW and OQ5CP. The trip was made over 1100 miles of "ghastly" roads and ten hours operating time was put in. Lessons learned: A. Take a more powerful rig. B. Take a VFO. C. Don't go in July. . . . Charlie, well known as VP9E, may now be heard as **ZB1CH**. . . . There have been several rumors about **ZC3AC** activity. We hear he skeds ZS6DW. . . . W6AM tells us about **VK4IC** who operates from Willis (not Wallis) Island some 300 miles off the Queensland coast. Willis has an area of 1086 sq. feet (Good place for a Mini-beam). . . . **KG4AU** departs for a two year stay in KG6-land. . . . A further report from W9FJY says that ZC3AB (Christmas Island) is on phone, 14150 to 14175 kc. . . . Finn, LB8YB, is now back in OX3-land. . . . W6CAE reports activity from **K6IG** on Chi Chi Jima (counts same as Iwo Jima). . . . W3GC reports QSO with **UAØAB** (giving QTH as Moscow). W3LOE also nabbed him. Other very doubtfuls were **ZA1FA**, 14060, and **PX1AC**. . . . **F9QV/FC** (Corsica) says he is QRV on 14080 each day at 2000 GMT. Good op. . . .

This very welcome QSL shows Bari, and party, departing for aircraft during VR2BZ/ZM7's September trip to Nukunono Island in the Tokelaus.

These well known DX'ers, (l. to r.): W6WB, W6TI, W6TT; (sitting) W6ATO and W6DZZ, will greet you with open arms at the Sixth Annual DX Conference sponsored by the North and South California DX Clubs. This will be held at the Hotel California, Fresno, Calif. January 15 and 16 1955. Other DX Clubs and DX amateurs throughout the world are invited to attend. Further enquiries may be addressed to Conference Chairman W6TI, Box 75, Oakland, Calif.

Mel Menges, KZ5EM, down Canal Zone way, keeps cool (at times) via his job as refrigeration engineer.

W5UUK reports FG7XA, 7006, T7, 0300 GMT. . . . W6WKE reports that **VP8BE** (Grahamland, Antarctica), is active on 7025 kc. with 200-watt rig usually between 0400 to 0600 GMT. He leaves next March but a bunch of QSL's will go forward in December. . . . From F9RS: In Madagascar **FB8BC**, **FB8BL** and **FB8BN** are active on phone. **FB8RG** and **FB8BN** are active on CW. **FB8BA** is inactive. **FF8JC** returns to F3EL in January. **FO8AD** will QRT on Rapa Island in October (1954), but **FO8AK** will take over.

DX'ploits

Frank, **W6MEK**, went to 248 with the addition of HKØAI while Frank, W6SYG, stayed close behind with SVØWK/9 for No. 247. . . . Paul, **W9NDA**, came up to date with a long list which jumped him from 216 to 244.

A vivid close-up of the August expedition to Navassa Island by Don, W4VZQ, Bob, W4QCW and Carl, WN4HBC. (Photos courtesy of W4RBQ.)
No. 1: Operating position at KC4AB shows W4QCW at the throttle.
No. 2: Local spur line of the N.I.R.R. (not used —no commuters!)
No. 3: Landing spot showing the "famous" iron ladder and boat furnished by the CO8 gang.
No. 4: Navassa Light winked calmly on.
No. 5: Operating shack was well shaded by a Royal Poinciana tree.

30 phone additions upped him to 203 in the "phone only" column. . . . George, **VE4RO**, upped to 240 with HKØAI. Vic also helped Dewey, **W6VE**, to No. 228. . . . Bob, **W5GEL**, back after a DX layoff, adds eleven to rest on 212 while Glenn, **W8KIA**, pushes to 239 with HKØAI. . . . Van, **W9HUZ**, eases up to 216 with VQ6LQ, SVØWK/9 and HKØAI. . . . Ev, **KP4KD**, moves to 207 with LU7ZM (So. Orkneys) and VP8AZ while **W3KDP** goes to 203 thanks to ZD6BX. . . . Buck, **W4RBQ**, edges closer to the 200 mark with HKØAI for No. 198 as Joe, **W6GPB**, hits 197 with help from VS4RO, FB8XX, VK9RH (Norfolk Is.) and HI8WA. . . . Bill, **W1HA**, ups to 205 with VR3A, SVØWK/9 and ZC7BB while Andy, **GM3EST**, happily on the way to recovery from a major operation in May, comes up with ZD3BFC for No. 202. . . . Pat, **W2GVZ**, cracked the 180 barrier with ZD6BX.

Fritz, **OE1FF**, added zone 39 with FB8BE and nabbed ZS9G for 147. . . . Lou, **W1MCW**, adds to her imposing phone total with HKØGP, LB8YB, ZD3BFC and SVØWK/9 to reach 216 while Mike, **YV5AB**, mikes his way to 159 with ten additions. . . . **DL7AA** moved to WAE/I with 55 countries and 204 points. . . . **DL1YA** went to 157 with VP6GT and ZS9I. . . . **W2PEO** and **W3AXT** nabbed ZD2DCP on 3505, 0325 GMT. . . . ZD2DCP was also No. 100 for **G6ZO** on 3.5 Congrats Jim. . . . **CO2CT** went to 173 thanks to FY7YE and **W7AH** keyed with VQ6LQ. . . . **WØOIS** A3'ed with KV4AA on 21 for his No. 11. . . . **F9RS**, with 50 watts, went to 152 with SVØWK, EL2P and ST2AC. He seeks QSL from KB7CL, PK5AA, HK4CF, HC1AZ, VP3FJ, VP4CO, VP5BL, AC3SQ, VS9GV, UH8KAA and XZ2EM. . . . Ted, **TI2BX**, went to 69 when ZS9G and CQ5VP were worked on 21 Mc. His XYL, Ginny, qualified for the Maritime Mobile Certif. by hooking 30/MM's in 90 days. She is now up to 39 /MM's with 33 confirmed. . . . **W1WAI** ups to 84 with such as YO3RD, EA9EB, FY7YC, OD5LC and ST2AR, all 14 CW. . . . 7 Mc activity at **DL4ZC** brought in ZE6JJ, ZL2FI, PY7QU and PY5VF. On 14 Lloyd came up with such as SVØWK/9, VS9AN, VP8AO, LU2ZC, I5PP and FQ8AG. . . . **JA8AA** was first JA to receive WASM Certificate.

Here and There

From Japan, Takeo, **JA1CR**, reports that the big signals on 14 CW from each W district are: W1TW, W2WZ, W3CRA, W4CEN, W5UX, W6ZZ, W7AH, W8UPN, W9EU and WØAIH. Most difficult states to work from JA are Del., S.C. and Vt. while the real tough zones are 9, 35, 2 and 40 in that order. Over 200 licenses have been issued in Japan, but most are of the 2nd class type which only permit activity on 80, 40 and above 6, A3 only. **K6DV** was issued the first AJD certificate outside of Japan. **JA4BB** needs two more states to complete WAS while JA1AA's zone and country total leads with a score of 37-134. . . . Dick, W3PZW, now keys from **KL7FAF**. . . . Irv, W4CGS/ex-W1BTE, was heard keying from **HR2AD** where he spent some time overhauling equipment damaged in Honduran floods. . . . Our best to **W6MEK** who was laid low for a spell. Slow is the essence Frank. . . . Tom, **TI2TG**, now in W6-land studies to take his General. . . . The **KC4AB** gang is already considering another DX trex next summer. Any suggestions? . . . Nevada is now in the bag for **G2DP** who says "Lookout UTAH here I come!" . . . KV4AA logged visits from **KH6ABS/KP4**, **W6NPO** and **W5LW** . . . Pete, W9JMR, keys from **HZ1AB**.

G6ZO received visits from **PAØUN**, **HZ1KE** and **MP4KW**. The last mentioned will be back in the middle east soon. . . . Ken, **WØYXO**, dropped in on W9YFV . . . **PK4DA** returns to his former QTH in Sumatra for a two-year stay after which he will come to the U.S.A. for permanent residence. As it is now impossible to get on the air from PK4 nowadays PK4DA has substituted photography for a hobby. Any missing QSL's for past contacts may be applied for via W6UZX. . . . Chas, **W1FH**, now has neat array of stacked TELREX beams on 21, 28 and 14 Mc. which replace damage done by "Carol." . . . W6LFX is now **W4DWN**. . . . Reliable info states that **MP4ABW** is no longer in Qatar. . . . **W9FII** is new Pres. of the W9-DXCC'ers. . . . **LZ1KAB** sports a new KW rig which is very much in evidence. Op Dimiter will be on each Saturday 1400/1900 GMT looking for DX. . . . Wes, SP3AN, has a new call, **SP2DX**. . . . It is requested that no ZA cards be forwarded to the LZ bureau for QSP as they cannot help and know of no official ZA stations being on the air. . . . Don, W7LAN, keys from **DL4MY** in Bamberg while Bob, K2GMO, has received the call of **DL4OZ**. . . . **FF8AJ** has moved to Abidjan. See QTH's. . . . Fred, W4KRR, was contacted keying from **W6RDF** recently. . . . Jack, **K2CPR**, (ex W3BXE), has 92 countries to show for a year's work as K2. . . . **ON4AU** seeks QSL's from VP5BF and VP5BH.

[*Continued on page 51*]

ALL TIMES IN E S T

EASTERN USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Northern and Central Europe	0800-1100 (3)	0530-0700 (2) 0700-1200 (3-4) 1200-1400 (1-2)	1430-1600 (2-3) 1600-1800 (3-4) 1800-0500 (2-3)	1700-1900 (2-3) 1900-0300 (3-4)
Southern Europe & North Africa	0730-1300 (3-4)	0600-0730 (2) 0730-1230 (3-4) 1230-1430 (2-3)	1430-1600 (2-3) 1600-1830 (3-4) 1830-0430 (2-3)	1700-1930 (3) 1930-0230 (3-4)
Near & Middle East	0730-1030 (1-2)	0630-1200 (2-3)	1630-1800 (2-3) 1800-0000 (2)	1800-2300 (1-2)
Central & South Africa	0830-1300 (1)* 0700-1130 (1-2) 1130-1400 (3)	0630-1330 (1) 1330-1630 (2-3)	1730-0100 (2)	1830-2330 (1-2)
South America	1000-1600 (1)* 0730-1430 (2-3) 1430-1630 (3-4)	0630-1500 (3) 1500-1700 (4-5) 1700-0300 (1-2)	1730-0300 (3-4) 0300-0630 (2-3)	1900-0430 (2-3)
South East Asia	Nil	0700-0900 (1) 1500-1800 (0-1)	0400-0700 (0-1)	Nil
Australasia	1600-1800 (1) 0600-0800 (0-1)	0630-0930 (1-2) 0930-1830 (0-1) 1830-1930 (1)	0100-0800 (2-3)	0300-0630 (1)
Guam & Pacific	Nil	0630-1000 (1-2) 1000-1600 (0-1) 1600-1900 (1)	0100-0700 (2-3)	0200-0530 (1-2)
Japan & Far East	Nil	0630-0900 (1) 1600-1800 (1)	0300-0700 (1)	0300-0600 (0-1)

ALL TIMES IN C S T

CENTRAL USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe	0800-1030 (1-2)	0600-0730 (1-2) 0730-1130 (3) 1130-1300 (1-2)	1430-1600 (1-2) 1600-1800 (3)	1730-0200 (2-3)
Southern Europe & North Africa	0730-1200 (2-3)	0600-0730 (1-2) 0730-1200 (3-4) 1200-1400 (2)	1430-1600 (1-2) 1600-1800 (3) 1800-0430 (2)	1730-0200 (2-3)
Central & South Africa	0900-1200 (1)* 0700-1200 (1-2) 1200-1400 (3)	0600-1300 (1) 1300-1530 (2-3)	1700-0000 (2)	1830-2300 (1-2)
Central America & Northern South America	1000-1400 (1-2)* 0830-1430 (4) 1430-1600 (2-3)	0700-0900 (3-4) 0900-1500 (2) 1500-1700 (4) 1700-0230 (1-2)	1600-0500 (4) 0500-0800 (2-3)	1730-0500 (3)
South America	1000-1400 (1)* 0800-1600 (3-4)	0700-0800 (3) 0800-1500 (2) 1500-1700 (4) 1700-0000 (1-2)	1700-0430 (3)	1800-0400 (2)
Japan & Far East	1600-1800 (1)	0700-0900 (1) 1500-1930 (2)	1600-1900 (1-2) 0200-0800 (1-2)	1630-1800 (1) 0200-0530 (1-2)
South East Asia	Nil	0700-0900 (0-1) 1600-1800 (1)	0200-0700 (1)	Nil

ALL TIMES IN C S T

CENTRAL USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Hawaii	1100-1700 (2-3)	1000-1800 (2) 1800-2000 (2-3)	2100-0300 (3-4) 0300-0800 (2)	2200-0630 (3)
Australasia	0600-0730 (0-1) 1500-1830 (2)	0700-1000 (2) 1000-1730 (0-1) 1730-1900 (1)	0100-0700 (3)	0300-0530 (1-2)

ALL TIMES IN P S T

WESTERN USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Europe & North Africa	0700-0930 (0-1)	0630-1000 (2)	1530-0030 (1-2)	1800-2330 (1)
Central & South Africa	0900-1300 (1) 1300-1500 (2)	0600-1300 (1) 1300-1700 (2)	1600-2200 (2-3)	1830-2100 (1)
South America	1000-1330 (1)* 0800-1300 (2-3) 1300-1530 (3-4)	0600-0900 (3) 0900-1400 (1-2) 1400-1730 (4) 1730-0300 (1-2)	1600-0000 (3-4) 0000-0600 (2-3)	1730-0330 (2)
Guam & Mariana Islands	1400-1700 (1-2)* 1200-1800 (3-4)	1030-1200 (2-3) 1200-1800 (1-2) 1800-2000 (2-3)	2330-0730 (3)	0030-0630 (2)
Australasia	1400-1800 (2-3)	0730-1000 (2) 1000-1800 (1) 1800-1930 (2)	0000-0630 (2-3)	0100-0600 (1-2)
Japan, Okinawa & Far East	1400-1800 (2)	1300-1700 (2-3) 1700-1830 (3-4) 1830-1930 (1-2)	2100-0830 (3-4)	2200-0700 (3)
Philippine Islands & East Indies	1500-1730 (2)	1400-1930 (1-2)	0100-0730 (1-2)	0330-0630 (1)
Malaya & South East Asia	1500-1800 (1)	1500-1900 (1-2)	0200-0700 (1-2)	0330-0630 (0-1)
Hong Kong, Macao & Formosa	1500-1700 (2)	1430-1730 (2) 1730-1900 (3)	0000-0730 (3)	0100-0630 (2)

Symbols For Expected Percentage of Days of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more

* Indicates time of possible ten-meter openings.

The CQ Propagation Charts are based upon a CW radiated power of 150 watts and are centered on Washington, D. C., St. Louis and Sacramento. These forecasts are, for the most part, based upon basic ionospheric data published by the CRPL of the National Bureau of Standards, and are valid until January 15, 1955.

Ionospheric Propagation Conditions

Forecast by

George Jacobs, W2PAJ
607 Beacon Rd., Silver Springs, Md.

Propagation Conditions - December

6 **Meters:** A minor peak in v-h-f ionospheric propagation usually occurs during December. Occasional short skip openings are expected, co-incident with auroral and sporadic-E activity.

0 **Meters:** DX generally poor, with erratic daylight openings expected on a few north-south paths during periods of good propagation conditions. Occasional short skip openings also possible.

5 **Meters:** Fair or better world-wide DX conditions expected during daylight hours.

0 **Meters:** Band closing earlier in the day because of shorter hours of daylight in the winter months. Daytime world-wide DX conditions fair to good from shortly after sunrise to shortly after sunset.

0 **Meters:** With maximum hours of darkness in the Northern Hemisphere during December, band will open for DX quite early. Fair to good DX expected to many areas of the world from a few hours before sunset to a few hours after sunset, with some paths open until shortly after sunrise.

) **Meters:** Generally fair or better DX expected to many areas of the world from a few hours after sunset to a few hours before sunrise. When MUF failure causes 40 meters to fade out on a particular circuit, check 80 meters for possible openings on the same path.

) **Meters:** Decreased absorption and seasonally lower atmospheric noise levels may permit rather strong signals on some DX paths during the hours of darkness on nights of exceptionally quiet propagation conditions.

This overall picture of band conditions is intended to licate qualitative changes in each amateur band from nth to month. For specific times of band openings for particular circuit refer to the CQ **Propagation Charts** the opposite page.

Winter Solstice

On December 22, the winter solstice will occur. This the day on which the sun reaches its most southern int in its travels from northern to southern skies. It also the day on which the sun is at its **nearest** stance to the earth. This astronomical phenomena has associated affects on short wave radio propagation.

Short wave radio depends upon the ionosphere as its dium of propagation. The ionosphere is created by ultra-violet radiation of the sun. The more ultra-let radiation that sweeps across the layers of the osphere, the more highly ionized are the layers and higher are the frequencies that can be used on a rticular radio circuit. When the sun is nearest to the rth, as it is during December, intense ultra-violet liation sweeps across the ionosphere during the hours daylight. This explains the reason for the seasonally gher daytime frequencies usable in the Northern Hemisere during the winter months, with the peak reached about the time of the winter solstice. However, the n is also far in the southern skies during this period, ulting in the maximum hours of darkness occurring the Northern Hemisphere at the time of the winter stice. This permits extensive night-time **de-ionization** the layers of the ionosphere, considerably lowering able frequencies. For this reason night-time usable quencies are at their yearly low on many circuits ring December.

During the period of the solstice, and the winter months general, usable frequencies are seasonally higher during the daytime hours and seasonally lower during the night-time hours than during any other season of the year.

Sunspot Cycle

This month's Charts are based upon a predicted smoothed sunspot number of 11, centered on December, 1954. The monthly Zurich sunspot number for September was 1.2, resulting in a provisional Zurich 13 month running smoothed sunspot number of 4.5 centered on March 15, 1954.

Book Review

Over the past few years many readers of this column have taken me up on the offer to answer specific questions concerning radio propagation. Each question received is answered by mail, and beginning this month, those questions that are of general interest will also be discussed in the column. When sending in your questions, please enclose a stamped addressed envelope and allow at least two weeks for a reply.

One of the questions that I am asked most often is to recommend texts on the subject of shortwave radio propagation, especially those that would be most useful for persons just beginning to have an interest in this subject.

Probably one of the finest texts ever written on the subject of practical shortwave propagation is **"Shortwave Radio and the Ionosphere"** by T. W. Bennington. **Mr.** Bennington is a member of the Research Department of the British Broadcasting Corporation. The main purpose of his book is to present information about shortwave propagation in an essentially simple form, so that it can be of use to those with only a limited technical knowledge of the subject. In this way it is intended to meet the needs of all those "users" of the ionosphere, whether amateur or professional. In the book, the use of mathematics has been avoided, and the physical processes involved explained in clear descriptive language.

The practical side of shortwave propagation is emphasized, and it is shown how scientific ionospheric data may be applied to everyday problems of shortwave transmission and reception. The subject is introduced in such a way as to make it comprehensible to the beginner: The formation and structure of the ionosphere are first discussed, and its effects upon a radio wave are briefly explained. The technique of ionospheric measurement is dealt with, and the nature of the continual variations that occur within the ionosphere are also discussed. The methods for applying the ionospheric information to shortwave transmission and reception are next reviewed at length, and some of the phenomena which particularly affect amateur radio transmission are specifically mentioned. Finally the cause and nature of ionospheric disturbances and of certain other phenomena, such as sporadic E and aurora effects, are also discussed.

All in all, this book is recommended for everyone having an interest in the subject—beginner and professional alike.

"Shortwave Radio and the Ionosphere" is published by Iliffe and Sons, ltd., London, England and can be obtained through any local book dealer. The price is approximately $2.50.

Season's Greetings and best wishes to all in 1955. In the new year we can look forward to rising sunspot numbers and improving DX conditions. The long range forecast for 1955 will be discussed in next month's column.

Last Minute Predictions

Moderate ionospheric disturbances are expected from December 1-3, 10-11, 21-24 and 27-30. Remainder of month is expected to be normal.

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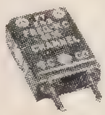

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1129	2825	3990	6206.6	7483.3	7916.7	8333.3
1150	2830	3995	6225	7491.7	7920	8340
1195	2835	4045	6235	7500	7925	8341.7
1525	2840	4095	6240	7506.6	7930	8350
1900	2845	4110	6250	7508.3	7933.3	8358.3
1915	2850	4135	6273.3	7510	7940	8360
1930	2855	4175	6275	7516.7	7941.7	8366.7
1940	2860	4215	6300	7520	7950	8370
1950	2865	4220	6306.6	7525	7958.3	8375
1965	2870	4255	6315	7530	7960	8380
2015	2875	4295	6325	7533.3	7966.7	8383.3
2017	2880	4300	6335	7540	7970	8390
2020	2885	4330	6340	7541.7	7973.3	8391.7
2025	2890	4340	6350	7550	7975	8400
2035	2895	4395	6362	7558.3	7980	8406.6
2040	2900	4445	6373.3	7560	7983.3	8408.3
2055	2905	4450	6375	7566.7	7990	8410
2060	2910	4495	6405	7570	7991.7	8416.7
2065	2915	4535	6406.6	7573.3	8000	8420
2090	2920	4540	6425	7575	8006	8425
2105	2925	4580	6440	7580	8006.6	8430
2125	2930	4610	6450	7583.3	8008.3	8433.3
2130	2935	4620	6473.3	7590	8010	8440
2135	2940	4635	6475	7591.7	8016.7	8441.7
2140	2945	4680	6500	7600	8020	8450
2195	2950	4695	6506.6	7606.6	8025	8458.3
2300	2955	4710	6525	7608.3	8030	8460
2305	2960	4735	6540	7610	8033.3	8466.7
2320	2965	4780	6550	7616.7	8040	8470
2350	2970	4785	6573.3	7620	8041.7	8473.3
2355	2975	4815	6575	7625	8050	8475
2360	2980	4820	6600	7630	8058.3	8480
2365	2985	4840	6606.6	7633.3	8060	8483.3
2370	2990	4845	6625	7640	8066.7	8490
2375	2995	4852	6640	7641.7	8070	8491.7
2390	3005	4880	6650	7650	8073.3	8500
2415	3010	4900	6740	7658.3	8075	8506.6
2430	3015	4930	6773.3	7660	8080	8508.3
2435	3020	4950	6815	7666.7	8083.3	8510
2440	3025	4995	6840	7670	8090	8516.7
2442	3030	5035	6873.3	7673.3	8091.7	8520
2450	5035	5090	6906.6	7675	8100	8525
2455	2040	5127.5	6940	7680	8106.6	8530
2460	3045	5165	6973.3	7683.3	8108.3	8533.3
2465	3050	5180	7000	7690	8110	8540
2470	3055	5235	7006.6	7691.7	8116.7	8541.7
2475	3060	5245	7025	7700	8120	8550
2480	3065	5285	7040	7706.6	8125	8558.3
2485	3070	5295	7050	7708.3	8130	8560
2490	3075	5305	7073.3	7710	8133.3	8566.7
2495	3095	5327.5	7075	7716.7	8140	8570
2505	3100	5335	7100	7720	8141.7	8573.3
2510	3110	5385	7106.6	7725	8150	8575
2515	3130	5397.5	7125	7730	8158.3	8580
2520	3135	5435	7140	7733.3	8160	8583.3
2525	3140	5545	7150	7740	8163.4	8590
2530	3145	5582.5	7160	7741.7	8166.7	8591.7
2535	3150	5587.5	7173 3	7750	8170	8600
2545	3155	5645	7175	7758.3	8173.3	8606.6
2550	3160	5687.5	7200	7760	8175	8608.3
2557	3165	5730	7206.6	7766.7	8180	8610
2560	3170	5760	7225	7770	8183.3	8616.7
2565	3175	5775	7240	7773.3	8190	8620
2570	3200	5782.5	7273.3	7775	8191.7	8625
2575	3202	5800	7275	7780	8200	8630
2580	3205	5820	7300	7783.3	8206.6	8633.3
2585	3210	5825	7306.6	7790	8208.3	8640
2590	3220	5850	7308.3	7791.7	8210	8641.7
2595	3225	5860	7316.7	7800	8216.7	8650
2650	3230	5892.5	7325	7806.6	8220	8658 3
2655	3235	5900	7333.3	7808.3	8225	8660
2660	3240	5907.5	7340	7810	8230	8666.7
2665	3290	5925	7341.7	7816.7	8233.3	8670
2670	3300	5955	7350	7820	8240	8673.3
2675	3310	5975	7358.3	7825	8241.7	8676
2680	3320	5995	7366.7	7830	8250	8680
2685	3340	6000	7373.3	7833.3	8258.3	8683.3
2690	3410	6006.6	7375	7840	8260	8690
2695	3420	6025	7383 3	7841.7	8266.7	8691.7
2705	3455	6040	7391.7	7850	8270	8700
2710	3465	6042	7400	7858.3	8273.3	8706 6
2715	3500	6050	7406	7860	8275	8708.3
2720	3510	6073.3	7406.6	7866.7	8280	8710
2750	3525	6075	7408 3	7870	8283.3	8716 7
2755	3640	6100	7416.7	7873.3	8290	8720
2760	3655	6106.6	7425	7875	8291.7	8725

FT-243 Cont'd

2765	3680	6125	7433.3	7880	8300	8730
2770	3700	6140	7440	7883.3	8306.6	8733.3
2775	3760	6142	7441.7	7890	8308.3	8740
2780	3800	6150	7450	7891.7	8310	8741.7
2785	3885	6173.3	7458.3	7900	8316.7	8750
2790	3940	6175	7466.7	7906.6	8320	

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2500 KC.	FT-243	1.99
2559 KC.	DC-34	2.99
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2629 KC.	DC-34	2.99
2632 KC.	FT-243	2.99
2637 KC.	DC-34	2.99
2637 KC.	FT-243	2.99
2638 KC.	DC-34	2.99
2638 KC.	FT-243	2.99
2670 KC.	FT-243	2.9
2647 KC.	FT-243	2.9
2670 KC.	DC-34	2.9
2738 KC.	type 1-C	2.9
2738 KC.	FT-243	2.9
2738 KC.	MC-7	2.9
2891 KC.	DC-34	2.9
2907 KC.	DC-34	2.9
2951 KC.	DC-34	2.9
2973 KC.	DC-34	2.9
2977 KC.	DC-34	2.9
2983 KC.	DC-34	2.9
3000 KC.	FT-243	1.9
3021 KC.	DC-34	2.9
3023 KC.	DC-34	2.9
3043 KC.	DC-3 4	2.9
3053 KC.	DC-34	2.9
3055 KC.	DC-34	2.9
3088 KC.	FT-243	2.9
3093 KC.	DC-34	2.9
3093 KC.	FT-243	2.9
3098 KC.	FT-243	2.9
3103 KC.	FT-243	2.9
3123 KC.	DC-34	2.9
3125 KC.	DC-34	2.9
3188 KC.	FT-243	2.9
3193 KC.	DC-34	2.9
3193 KC.	FT-243	2.9
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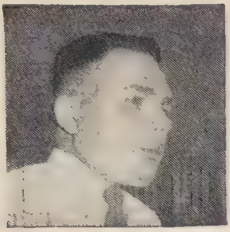


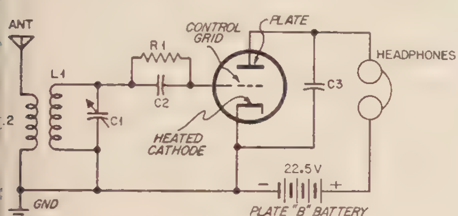
the Novice Shack

Conducted by

HERBERT "HERB" S. BRIER, W9EGQ

385 Johnson Street, Gary 3, Indiana

Last month, we concluded our discussion of elec-
ron tubes with diode detectors. The big disadvan-
age of such detectors is that their output power is
io greater than the power delivered to them by the
eceiving antenna. As it requires a milliwatt (.001
vatts) of audio power in a pair of phones to produce
; usable signal, and a 100-microvolt signal at the
ntenna terminals of an amateur communications re-



(C1, L1 TUNED TO DESIRED FREQUENCY)

(A) BASIC GRID LEAK DETECTOR

Fig. 1(A). The basic grid-leak detector circuit. This circuit is almost never seen in modern receivers because of the very low efficiency.

eiver is considered a strong signal,* a diode detector
equires a tremendous signal to be useful.

The Triode Vacuum Tube

DeForest provided the tool for building more
ensitive radio receivers, as well as thousands of
ther electronic devices, when he added a grid of
ne wires between the plate and the cathode of a
iode, transforming it into a three-element or *triode*
ube.

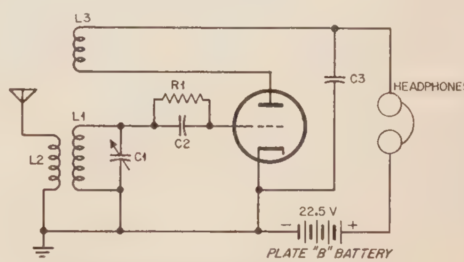
The function of the new element in the triode,
alled the *control grid*, is found by applying a fixed
oltage to the plate of the tube and measuring the
late current while varying the grid voltage, then
olding the grid voltage constant while varying the
late voltage. It will be discovered that a small
hange in grid voltage has as much effect on plate
urrent as does a large change in plate voltage.

Why the control grid has so much control over
ie plate current in a triode is simply a matter of
istance. It is closer to the cathode than is the plate;
herefore, it controls the electrons emitted by the
athode with a smaller stick than the plate must use.
he nice thing about the whole thing is that the grid
eldom expends any energy in exercising its powers
f control.

This interesting condition is achieved by operating
ie control grid with a fixed, negative bias on it and
miting the peak signal voltage to a value that does not exceed the bias voltage. In this manner, the grid does not draw current during any part of the excitation cycle; therefore, it does not consume power in controlling appreciable amounts of plate-circuit power.

In some applications, the grid may be driven somewhat positive. Even then, it consumes comparatively little power, because relatively few electrons actually strike the grid wires. The rest flow between them to the plate, as long as there is a higher positive voltage on the plate.

The ratio between the grid and the plate voltages



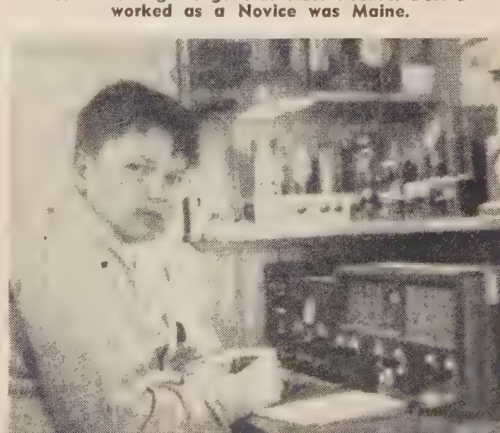
REGENERATIVE FEEDBACK VARIED BY COUPLING BETWEEN L1 & L3, CAPACITY OF C3 OR PLATE VOLTAGE.

(B) REGENERATIVE GRID LEAK DETECTOR

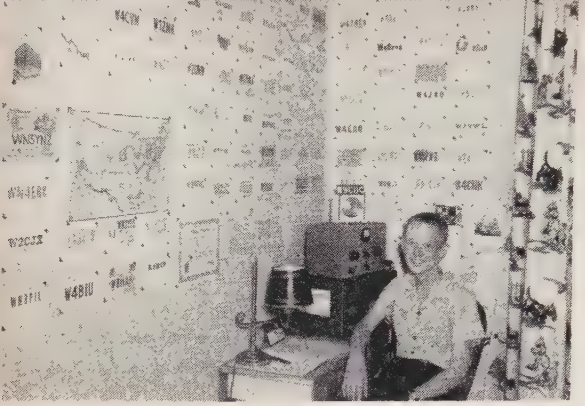
Fig. 1(B). This is the popular regenerative circuit which feeds a part of the plate signal back into the grid circuit to obtain additional amplification.

required to produce a given (small) change in the plate current of a triode is called its amplification factor or *mu*. The *mu* of modern triodes runs between about 2 and 100. As the factors which increase the *mu* of a tube also decrease its plate current, a high-*mu* tube is used when high amplification of signals is required, and a low-*mu* tube is used when power output is more important than high amplication. A *mu* of about 20 is average for a general-purpose triode.

Richard Carty (15) K6CYT, Pomona, Calif., just after receiving his general class license. Best DX worked as a Novice was Maine.



Several modern communications receivers have "S" meters calibrated to indicate S9 when a 100-microvolt signal is presented to their antenna terminals. Assuming a 300-ohm input impedance, a 100-microvolt signal represents approximately 0.00000000003 watts of signal power.



Mickey Manor (15), WN9CUC, Muncie, Indiana, operates on the 3.7 and 7.2-Mc. Novice bands and has worked 38 states and Canada. His smile will be even bigger when one of the California stations he has worked sends him a card.

The Triode Detector

The first use of a triode tube was as a detector. *Figure 1* shows several typical circuits. In *Fig. 1A*, the grid and cathode form a diode detector, with *R1* and *C2* acting as the load resistor and filter capacitor. *C2* also serves to bypass the incoming signal around *R1*. The rectified signal currents flowing through the resistor develops a voltage across it, which applies a negative voltage to the grid. This voltage then varies with the modulation on the signal, causing a corresponding variation in the plate current. The varying current flowing through the phones produces an audible output signal which is ten to twenty times as loud as the same input signal would produce from a diode detector.

Besides the audio-frequency signal, the radio-frequency signal also appears in the plate circuit of the detector. However, its frequency is too high to be audible, and the capacitor *C3* bypasses it around the phones to ground. Later, it was discovered that by feeding back part of this radio-frequency signal to the grid circuit of the tube; so that it travelled through the tube again in step with the original signal, far louder signals were delivered from the phones.

Figure 1B shows this *feedback* obtained by means of inductive coupling between the plate and grid circuits. In other circuit arrangements, it can be obtained through capacitive coupling with the same end results.

The above process is called *regeneration*. If carried beyond a certain critical point, the energy fed back from the plate to the grid circuits will become sufficient to overcome all circuit losses, and the tube will break into sustained *oscillations*. When this happens, the tube is converting part of the direct-current energy supplied to it by its power supply into alternating current, without the aid of an incoming signal. The frequency of oscillation is determined almost entirely by the resonant frequency of *L1* and *C1*.

Oscillators are extremely important in their own right, and I shall come back to them later. For the present, I shall continue discussing detectors.

Greatest sensitivity in receiving modulated signals with a regenerative detector is obtained with the regeneration adjusted to just below the oscillation point. When the detector actually oscillates, a whistle is heard in the phones every time a signal is tuned in. Under these conditions, the signal generated by the detector itself *beats* or *heterodynes* with the coming signal to produce a third signal, the f quency of which is the difference between the f quencies of the other two.* Thus, by tuning detector to a slightly different frequency than th of the incoming signal, an audio *beat note* is hea in the phones.

In the above manner code signals, which modulated only to the extent of being broken into dots and dashes, can be received with a generative detector. It is important that the dete tor not be allowed to oscillate too vigorously; oth wise, the signal generated in the tube itself w swamp out the incoming signal.

The detectors of *Figs. 1A* and *1B* are called *gr leak* detectors. They are sensitive to weak signa but overload easily on strong ones. This follows cause the negative voltage produced on the grid the rectified incoming signal reduces the tube pla current. Sufficiently strong signals will cut off t plate current completely, resulting in highly disto ed output.

Figure 1C is the circuit of a *biased* or plate-circ detector. It is less sensitive than the grid-leak ty but it will handle strong signals without overloadi It works in the following manner: The fixed g bias reduces the plate current to practically ze Therefore, when a signal is tuned in, the plate c rent increases on the positive half cycles of t signal, but it cannot decrease appreciably on t negative half cycles, because it is virtually zero

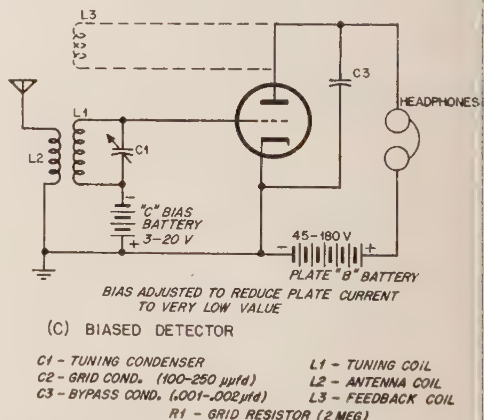


Fig. 1(C). The bias detector (sometimes called the plate detector) will handle greater signal voltage than the circuit shown in Fig. 1(A).

ready. As a result, the average plate current creases with signal. The modulation on the sign then varies this current, as already described, produce a signal in the phones.

The Triode Audio Amplifier

While the sensitivity of a regenerative detector is f greater than that of a diode detector, its output is st far from ear-splitting. So, with a few magic passes, convert another triode into an audio-frequency amp fier. **Figure 2** shows the circuit.

In the circuit, the primary of the audio-frequen transformer replaces the phones in **Fig. 1**, and the aud frequency signal flowing through it induces a replica the signal into the transformer secondary windi From there, the signal, goes, via the volume control, the grid of the tube, to be amplified before being livered to the phones.

Obviously, the most important requirement of su

* The heterodyning action will also produce a sign that is the sum of the original frequencies, but need not concern ourselves with it at this time.

an amplifier is that its output signal should be an amplified replica of the input signal. Adjusting the grid bias voltage; so that the tube is operated on the most linear portion of its grid-voltage, plate-current curve helps achieve this goal.

As the input signal causes the tube plate current to vary above and below its no-signal value, the current remains constant, with or without signal, as long as the input signal is not excessive or highly nonsymmetrical. A tube operated in the above manner is called a **Class A** amplifier.

Referring again to **Fig. 2**, when the alternate resistance-coupled input circuit is used, the audio signal currents flowing through the input resistor produces an audio-frequency voltage across the resistor. This voltage is coupled, via C1, to the grid circuit of the amplifier, from which point the action is as already described.

Transformer coupling is normally used in audio amplifiers when the grid (or other load) circuit draws power, impedances must be matched, or it is necessary

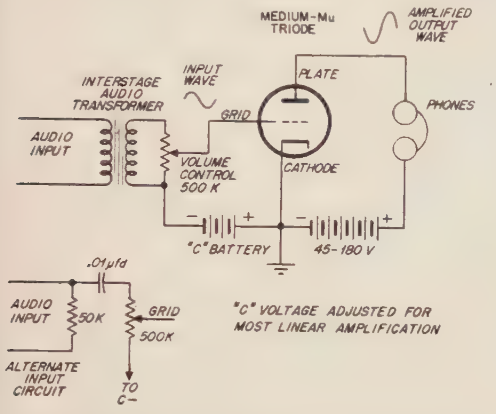


Fig. 2. Basic class A triode audio amplifier. When its input circuit is substituted for the phones in Fig. 1, the circuit of the standard amateur receiver for many years is formed.

to keep d-c resistances to a minimum; otherwise, resistance coupling is used, because of its much lower cost.

The circuit of **Fig. 1B**, combined with that of **Fig. 2**, produces what was the standard amateur receiver for many years. Considering its simplicity, it is still an efficient code receiver in the 3.5-Mc. and 7-Mc. bands, although it does not compare in effectiveness with modern, multi-tube, communications receivers. It is easily "blocked" by strong local signals and is neither very selective nor extremely sensitive.

In our next discussion of vacuum tubes, we shall learn of some of their other uses in amateur equipment and how additional elements have increased their versatility.

News For And About Novices

Lee, **W6MNN**, writes from north of the 38th parallel, **Korea**; "After reading about EL2X hearing Novices in Liberia, it occurred to me that some of the boys would like to know they are getting into Korea. Unfortunately, I have not kept a record of calls, and the only one I recall off-hand is KN6ELZ, whom I have heard several times with strengths up to S7 on 7 Mc. I hope he is as thrilled to hear this as I would have been when I was on the air in the States to hear that I was being heard so far away. I'll drop you a line from time to time, to let you know of other WN's I may hear."

Bob Rose, **KN6GKU**, 6128 Temple City Blvd., Temple City, Calif., reports; "I have found that Ham radio is **about it** when it comes to fun and friends. We have four Hams on one block—two Generals and two Novices. W6FHN, who started me in this game, is my chief competitor. He is running 100 watts to a vertical antenna not 300 feet from my antenna, also a vertical, which I drive with 35 watts to an **AT-1** transmitter. Well, it's rough, but we are the best of friends, and I would not have anybody else there, hi.

"I haven't set any DX records, but I have worked the Atlantic Seaboard. My li'l vertical will skip in anywhere; so I will be glad to sked anyone who needs California."

Doug Conrad, **VE1UY**, 163 Carmarthen St., St. John, N.B., Canada, says; "I wouldn't miss reading the **Novice Shack** at all to find out what other fellows about my age (17) are doing with their rigs. . . . I run about 30 watts to a doublet antenna, and I use an **S-38B** receiver. In two months on the air, I have worked Maine and four Canadian Provinces. I shall be glad to help any interested person in or around St. John to obtain his amateur license."

Kim Keller, **WN4HYQ**, P.O. Box 167, Albertville, Ala., reports; "I am 13 years old and have had my ticket for a little over a month. My transmitter is a 6AG7-6L6 running about 30 watts, and my antenna is a grounded Marconi. I have had about 50 QSO's in 13 states. Best DX has been about 1100 miles. Anyone need a QSL from Alabama?"

Claude Sauvain, **WN5GAQ**, 5808 West 8th St., Tulsa, Okla., says; "I have a **TBS-50D** transmitter and an **S-76** receiver. I have worked 15 states, but I have about five QSL cards all filled out in the 'dead QSL file,' because I don't have addresses for them. I'll be glad to sked anyone needing Oklahoma."

John Hudick, **WN2ZJU**, 440 Owen St., Swoyerville, Pa., reports, "Some guys think they have trouble. They should hear about mine! After building my transmitter five times, lo and behold! It worked. I was ready to throw it out the window four times. After I finally got it working, I made my first contact with a YL, KN2ICX, but then I lost her in the QRM. My rig is a 6L6, with about 10 watts input, my antenna is a Zepp, and my receiver is an S-38C."

The writers of the next two letters should get together. Bill Butler, **KN2IYO**, 123 Sherron Ave., Salem, N. J., says; "In two months I have had 30 contacts in eight states, running three watts and using an **S-38** receiver. I would like to form a club among Novices and Generals who run less than ten watts input."

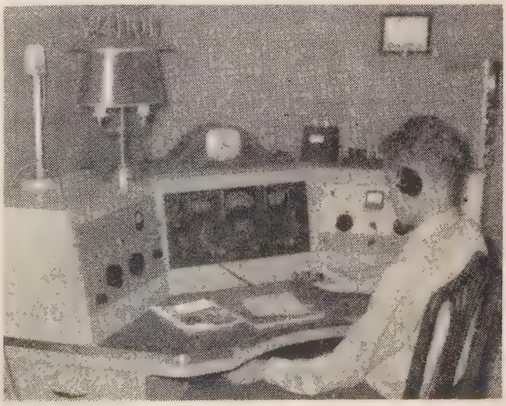
F. Allan Herridge, **G3IDG**, 95, Ramsden Road, Balham, London, S.W. 12. England, writes; "I'm not a Novice but I do read your pages in **CQ** each month. From the pictures you print, lots of Novices over there use simple equipment and low power. I am a great believer in both and have never run over ten watts input on any band in my three years on the air.

"I don't know if any of your readers would be interested, but we have here a **QRP Society** which encourages the use of low power. It is suggested that overseas Hams confine themselves to 20 watts input. U.K. Hams to use a maximum of five watts input, except when contact is being established, at which time a maximum of 20 watts may be used. The Society publishes a monthly magazine. At present there are three "W" members—W2EQS, W2QHH, and WØPRM. No Novices you notice, but no doubt many of them could qualify for the Society and might be interested in it. Full information can be obtained from: John Whitehead, The Retreat, 92 Rydens Ave., Walton-on-Thames, Surrey, England."

Harry Sherman, **WN8SUA**, R. #1, Box 114, Lansing, Mich., writes; "I am 47 years old and have had my license for about six weeks. I have had 129 QSO's in ten states, using a **Heathkit AT-1** transmitter and an **S-38** receiver. This has been on 3.7 Mc. Next week, I am going to try 7.2 Mc."

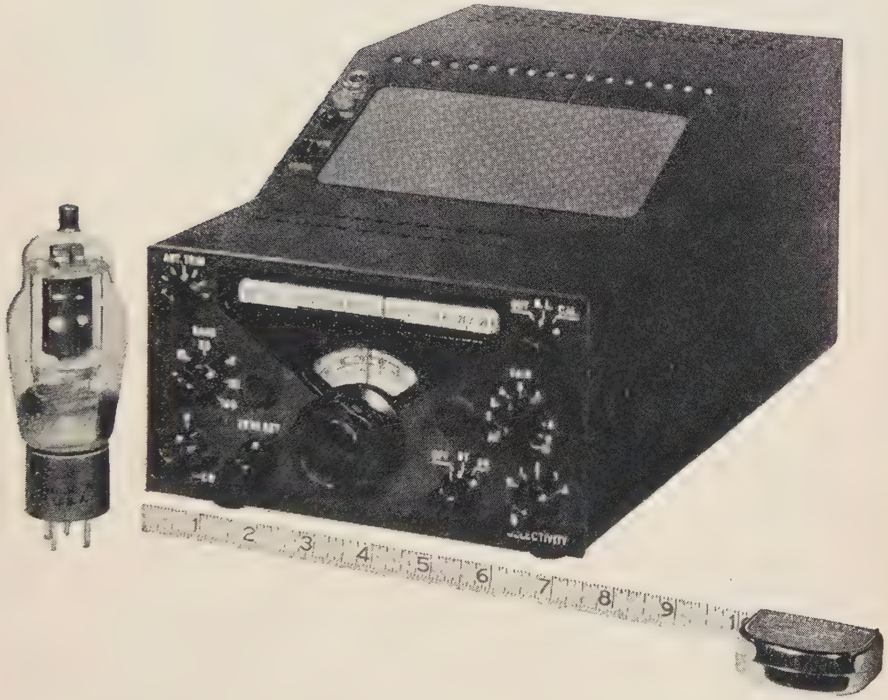
Fred R. Herr, **W3WPV**, 911 Old Manoa Road, Havertown, Pa., says; "I am writing this as a Novice, but I am waiting for my General ticket, as I recently passed the examination. During my spell as a Novice, I have worked 13 states, all in a general NE-SW direction from here. Best DX has been WN4GMR, Miami, Fla. . . . My transmitter is home-made. It operates at a pressure of ten watts, and it surely covers the land. Receiver

[*Continued on page 58*]



Ex-Novice Jim Morrell, W4DQI, Arlington, Virginia. The operating console is modelled after the one in the local MARS station.

the Ultimate



Mobile Receiver

R. A. Eidemiller, WØMWD

The last page of the "Radio Amateurs' Mobile Handbook" (1953) contained an intriguing photograph which many readers mistook to be a commercial mobile version of a popular Ham receiver. Instead it was a Ham-built superb piece of equipment. Upon closer examination the Editors of CQ were surprised to find that they could not adequately describe this receiver so that it might be reproduced by those readers possessing ability and facilities to do so. In its place, and because of the wide interest it has aroused, we are pleased to at least present this "photo story."—*Editor.*

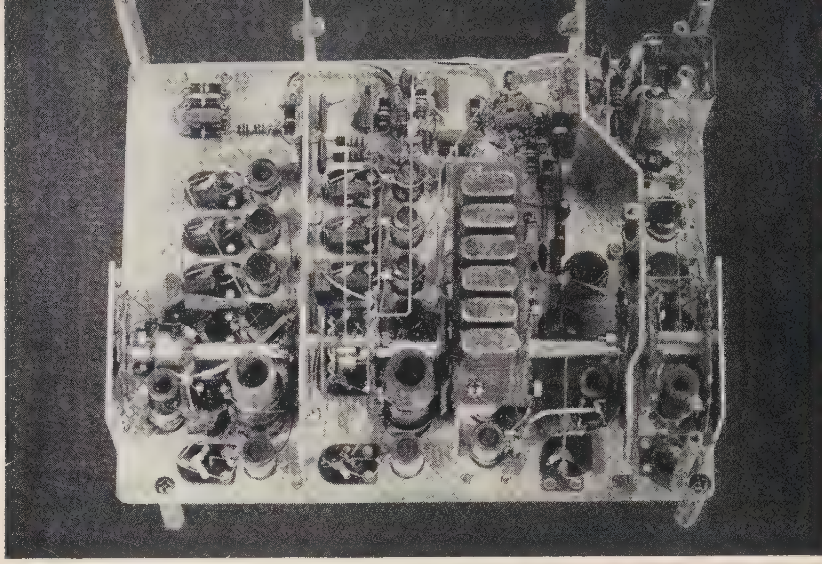


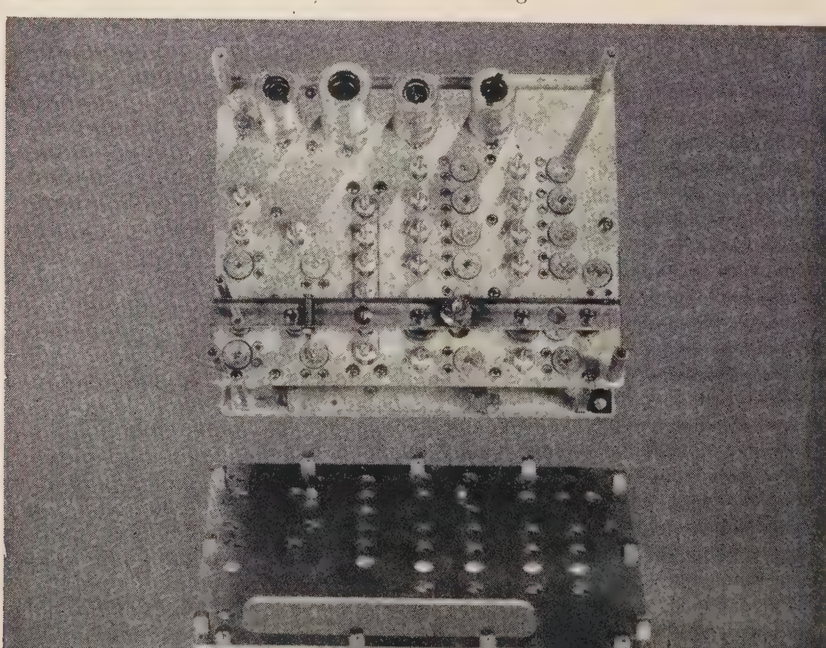
Fig. 1. View of the r-f assembly showing wiring and all crystals installed.

Fig. 2. The adjustment end of the coils and condensers in the r-f chassis are shown in this view. The rear plate shows the various holes and cutouts made to allow access for alignment tools. This photograph was taken before the gear train was installed on the rear plate.

It all started a few years ago during one of those typic Ham bull sessions. It was generally conceded that the mai receiving problem had now shifted from one of sensitivi at the higher frequencies to one of selectivity at the lo frequencies. Of course, one must still have a fairly se sitive receiver, but laments were loud and long about som joker 15 or 20 kc. away covering up a fixed station ju after the mobile had yelled his lungs out to set up th contact. Usually this S9-plus signal didn't bother th mobile signal at the fixed station—he had a *selective* r ceiver, but it certainly ruined mobile reception in a larg chunk of the band.

As the discussion waxed hot and heavy, someone summe up the perfect specifications for a mobile receiver. It mu have 5 kc. selectivity, 2 μv. sensitivity, calibrated bandsprea no drift, dual conversion, built-in BFO, noise limiter, cryst filter, S-meter . . . and so on.

After the session broke up, nothing much was though about this mobile hallucination until some time later whe in sorting out the usual accumulation of Ham junk in th desk drawer, we ran across the specification list that wa written down during the bull session.



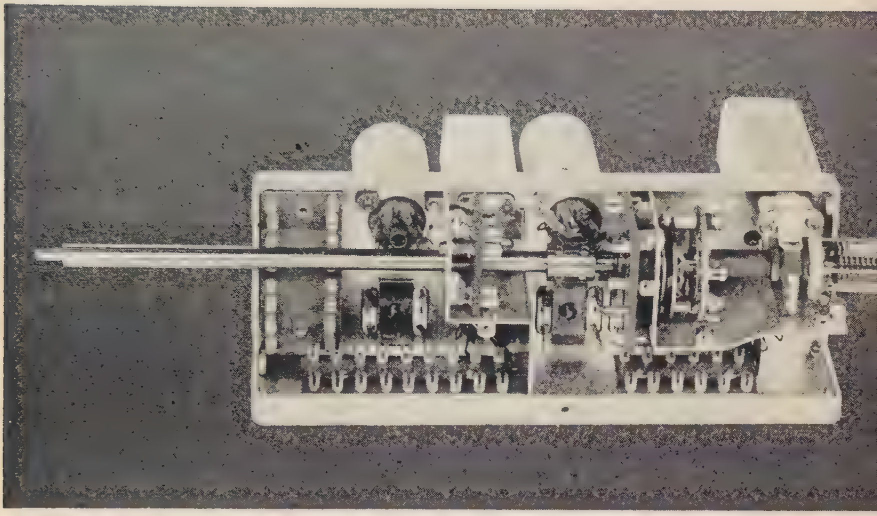
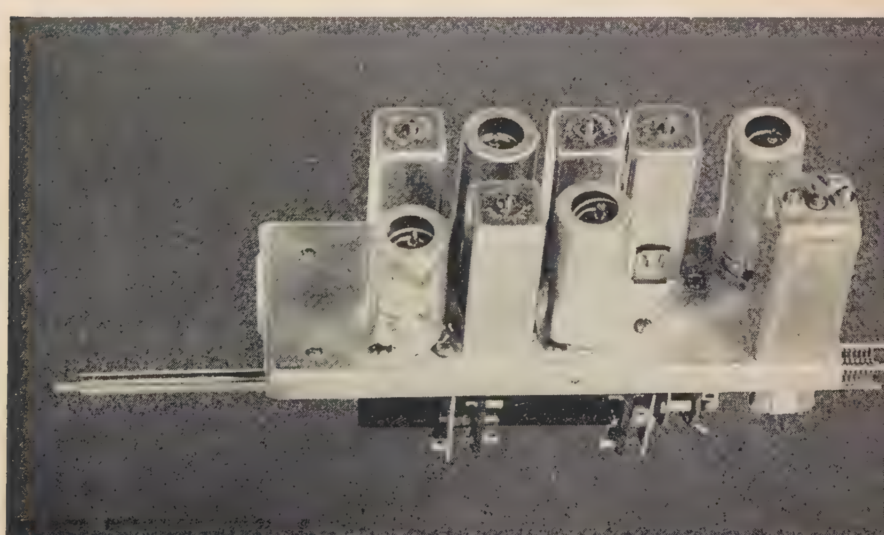


Fig. 3. Bottom view of the i-f chassis before wiring. The crystal filter unit and shield is shown in the upper right corner.

Fig. 4. Top view of the i-f chassis. The space at the right is for later installation of a Collins mechanical filter.



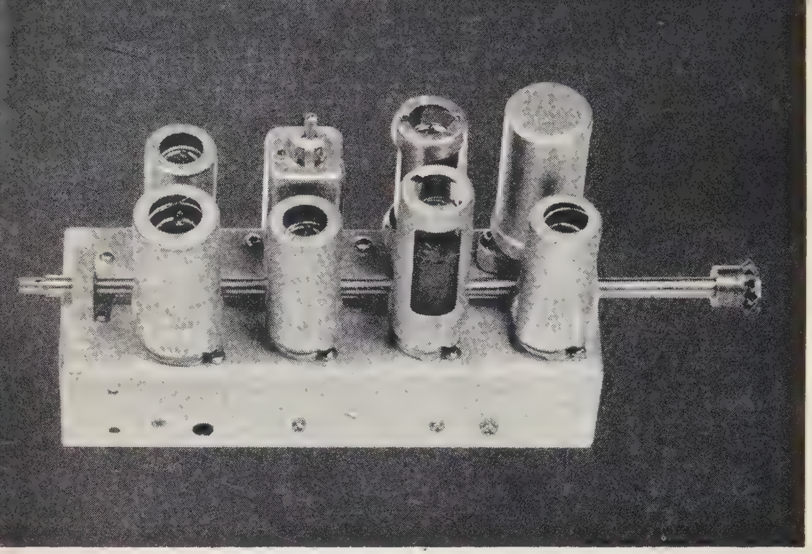


Fig. 5. View of th
chassis. The bandsw
is shown in positio

It suddenly dawned on us that this specific receiver (in a larger version, to be sure) was sitting upon the operating table: The *Collins 75A2!* True, it was gargantuan as compared with what could be permitted in a mobile installation, but didn't it possess or exceed all the desired characteristics of the ideal mobile receiver? Couldn't it be shrunk?

Forthwith the cleaning project was abandoned and the receiver was removed from its cabinet. Here started what was to be the first of many an hour of probing the innards, measuring, noodle scratchin', and sketching. Initially, the idea had been to dismantle the *75A-2* and use most of the parts in a smaller version. This idea was given up as impractical, since many of the parts in the *'A-2* were just too big. However, most of these large components are duplicated in a miniature line by various manufacturers, and the use of these miniaturized components permitted a satisfactory shrinking job to be done on the receiver. The electrical circuit of the *'A-2* was duplicated, with the exception of the power supply, and the c-w noise limiter.

General Physical Layout

After considerable juggling of parts, the shrinking job finally boiled down the receiver proper into three main chassis assemblies:

1. The r-f unit with its 3 chassis plates, slug rack, bandswitch, coils, crystals, etc. (*Figs. 1* and *2*).
2. The i-f chassis with its i-f transformers, crystal filter and detector. (*Figs. 3* and *4*).
3. The audio chassis, which has the audio stages, b.f.o., 100-kc. calibrator and noise limiter, (*Figs. 5* and *6*).

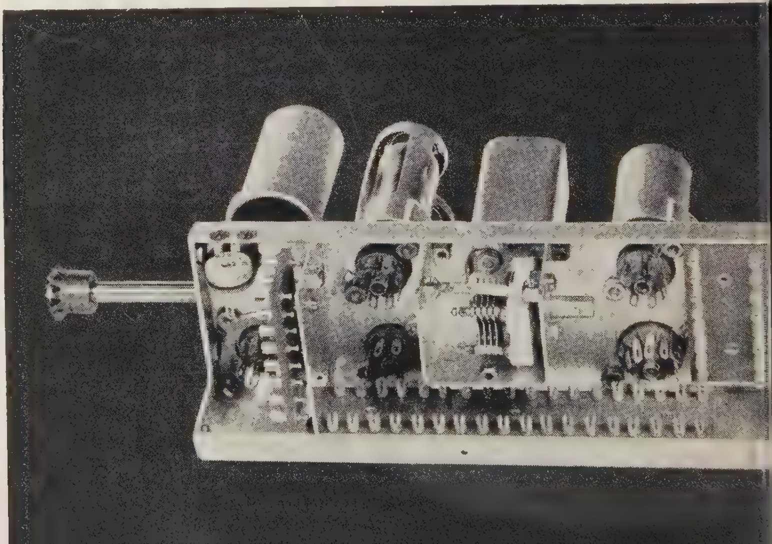


Fig. 6. Bottom view of the unwired audio chassis. The variable condenser is for b-f-o pitch. The ceramic trimmer is for 100-kc. calibrator adjustment from outside the cabinet.

These three chassis are assembled, separately, nd then combined into one unit, as shown in *'igs. 7* and *8.* The speaker and output transormer are mounted on the top lid of the abinet and the "S" meter is mounted in a pecial clamp that may be attached to the steer-ng column of the car.

he R-F Unit

The r-f unit utilizes the *75A-2* coils, and pecial *Oak miniature type F* wafer switches. 'he axis of the *Oak* bandswitch is parallel to he front panel of the receiver, and a right-ngle drive must be used between the switch as-embly and the bandswitch shaft. A special ear reduction is mounted on the mounting late of the *PTO* unit to provide correct tun-ng speed for the movable slug rack. This slug ack, as well as the *PTO* unit is tuned by the nain tuning dial of the receiver. The r-f sec-ion of the receiver is approximately 7½"x6"x5" n size. The tube lineup is 6CB6 r.f., 6BE6 nixer, 12AT7 h-f xtal osc., and 6BE6 2nd mixer.

'he I-F Unit

This section of the receiver is link coupled o the 6BE6 2nd mixer, and contains the crystal ilter, three 6BA6 i-f stages, 6AL5 detector and .v.c. and the *S*-meter circuit. It is located to he right of the *70E-12 PTO* and measures bout 6½"x2½"x1½", exclusive of tubes. pecial high "Q" i-f transformers are used to btain communication selectivity. The crystal witch and phasing control *(Fig 3)* shafts are oncentric, with the center phasing shaft unning through the switch to the phasing con-rol at the rear of the chassis. Terminal boards re used to mount the resistors and condensers vhere practical.

'he Audio Unit

The audio chassis is on the left side of the eceiver, directly opposite the i-f chassis. The andswitch drive shaft and antenna trimmer haft run down the center of the chassis be-ween the tubes *(Fig. 5).* On this chassis are: The 6BA6 beat frequency oscillator, 12AX7 .v.c. and audio stage, 12AL5 noise limiter and AQ5 output tube. In the rear chassis corners re the 100-kc. crystal and the 6BA6 oscillator ube. The audio chassis is about 6½"x1½"x½" n size. A small shield encloses the b-f-o tun-ng condenser. As on the i-f chassis, all small esistors and condensers are mounted on termi-al boards which are wired before installation.

'he Master Oscillator

The *70E-12* oscillator is mounted between he i-f chassis and the audio chassis. A 3-gear rain drives the slug rack shaft and the dial ointer gear. The oscillator and sub-chassis re mounted to a sub-panel, mounted about ¼" behind the main panel. The dial drive nechanism is mounted in this space, along with he dial lamps and various panel controls.

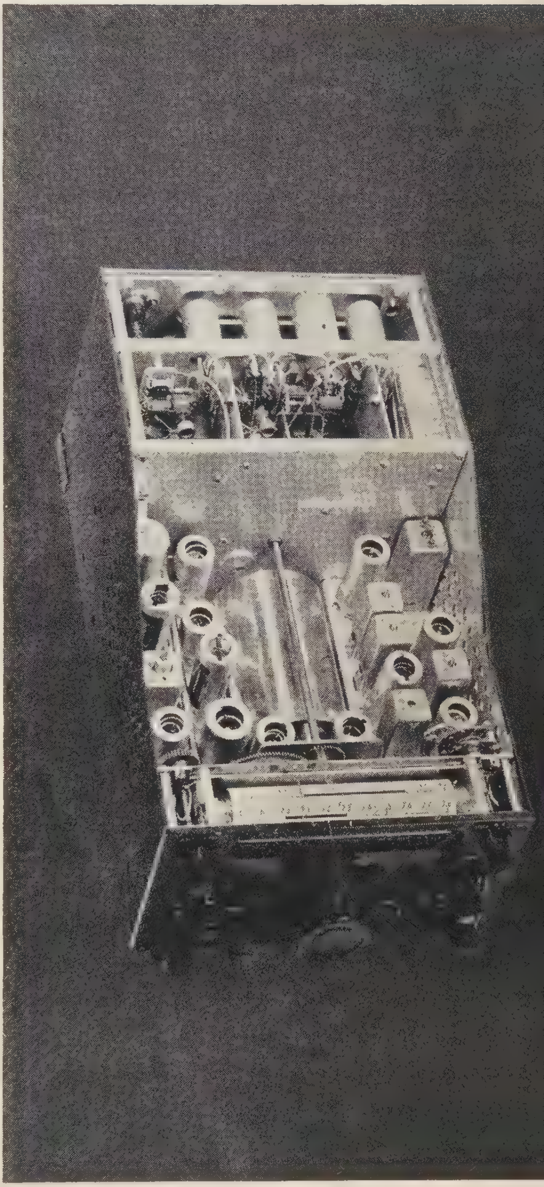


Fig. 7. Top view of the completed receiver.

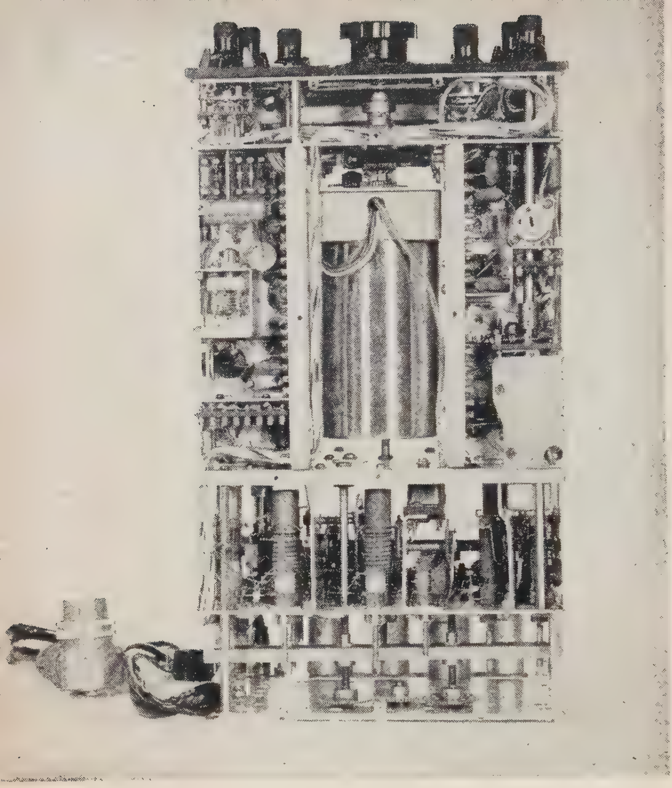


Fig. 8. Bottom view of the wired receiver. Note the gear train and extra slug rack lead screw drive. For the uninitiated, the "can" in the center is a Collins 70E-12 PTO.

General Assembly

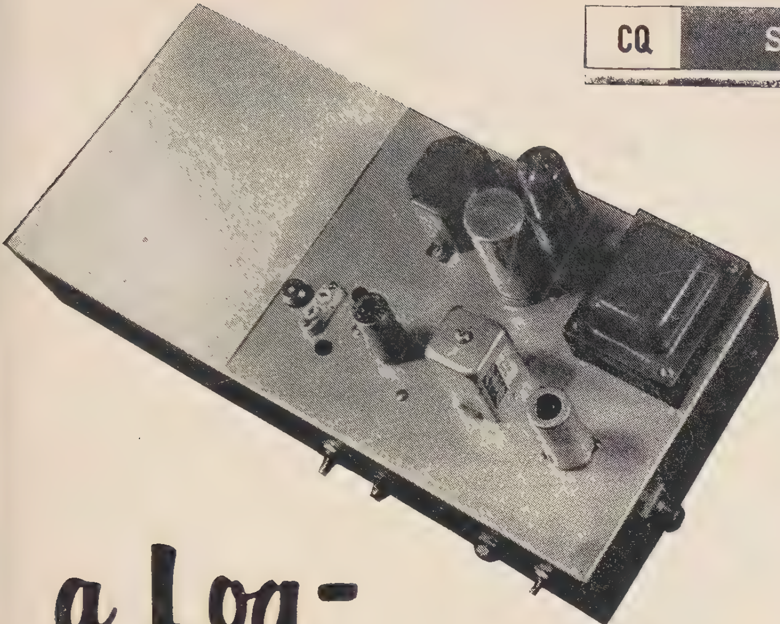
The front panel is made of laminated lucite, with engraved letters and numerals. It is edge lighted by "grain of wheat" lamps, so that the engraved letters are illuminated at night. A special miniature drum dial and kilocycle dial were made to fit the available panel space. As in the *75A-2*, the scales are color coded, and a fiduciary control is provided to set the line on the kilocycle scale for accurate frequency readings. The megacycle pointer is driven by a dial cable from the drum mounted behind the support panel.

The small knobs on the front panel were turned from solid aluminum stock. The large knobs were made from brass and the "wings" soldered on after the knobs were turned on a lathe.

The receiver cabinet is nothing more than a wrap-around with ventilation holes drilled in it. Large cut-outs in the bottom give access to the underside of the receiver. Plates cover the cut-outs when not in use. The top of the cabinet holds the speaker, output transformer, phone jack, and local-remote switch. The receiver is mounted in the car by a rear bracket to the firewall, and angle brackets under the dash. The separate power supply can be mounted anywhere convenient. A separate a-c operated supply has also been made for normal Ham shack use of the receiver.

Performance

When the receiver was completed and aligned, it provided a 10-db. signal/noise ratio with a 2 μv. or less signal on all bands, and had a pass-band of 5 kc. at 6 db. down, 17 kc. at 60 db down. The receiver performs very well in a car, and does not drift or change frequency when the car generating system is turned on and off. It is a new sensation to be riding along listening to the SSB boys and their relatively QRM-free channels, or to be able to tell your contact his frequency and be sure of it! We had to get used to the luxury of the crystal filter in fighting the ever-present QRM, and the master oscillator is "tops" for reset accuracy when checking signals on any of the 7 bands. All in all, it has been a very rewarding construction experience, and the months of work inherent in the construction of such a receiver are more than repaid by its splendid performance.



Above chassis view of the log-linear amplifier and detector. The blank space at the end of the chassis provides working room with testing a new filter.

a Log-Linear Detector

Jack N. Brown, W3SHY

Contributing Editor

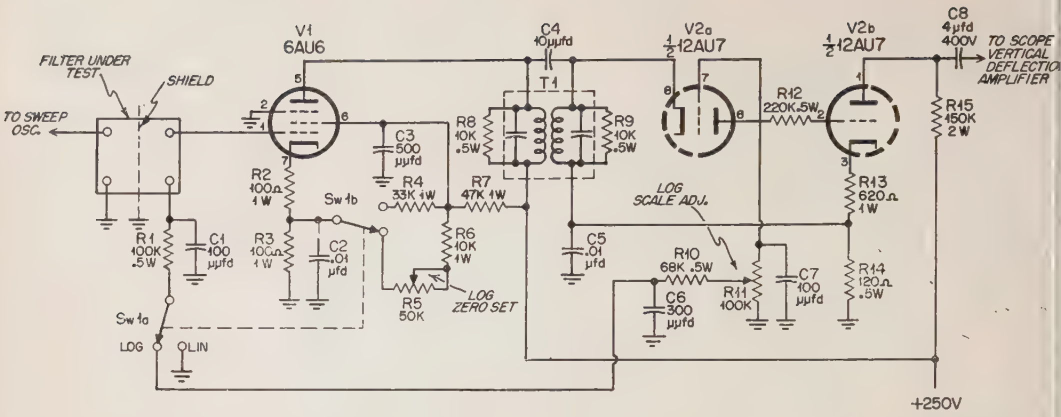
In his book "Single Sideband Techniques" (just released) the author describes a very low rate sweep generator. (The "Ferri-Sweeper") It is a basic requirement to properly align many types of SSB filters. Another useful device in this work is a log-linear detector and amplifier. —Editor.

This device is nothing more than a class A i-f amplifier with a very broadly tuned transformer in its plate circuit feeding an a-v-c detector. This detector is also the video detector for the oscilloscope presentation. The application of the a-v-c voltage on the control grid of the amplifier stage following the filter will result in a response that is a fair approach to a logarithmic amplitide response in the final oscilloscope picture. The time constant of the a-v-c circuit must be quite short in order to follow the rapidly changing filter response as the oscillator signal is swept through the filter passband.

Circuitry and Theory of Operation

Figure 1 shows the schematic of the "Log-Linear Amplifier." Tube *V1,* is a remote cut-off pentode that is used in many broadcast sets. Switch, *Sw1,* you will note gives you the choice of either logarithmic or linear amplitude response. The "A" section of *Sw1,* when in the "linear" position, disconnects the a-v-c voltage and grounds the grid return circuit so that no a-v-c voltage is applied. The "B" section of the switch changes the fixed bias that is created across the one cathode resistor, *R3,* by bleeder action to the B plus line through resistor *R4.* The video detector, *V2a,* is one-half of a *12AU7.* The diode detector is biased by the slight threshold voltage generated across resistor *R14.* The second portion of the *12AU7, V2b,* is the video amplifier that raises the signal level to a few volts so that the average oscilloscope vertical deflection amplifiers will not have any trouble with insufficient signal. The 4.0 μfd. coupling condenser is necessary to handle the low frequency response of the rectified signal envelope at the very slow sweep rates used in the "Ferri-Sweeper."

The i-f transformer, *T1,* must be loaded down with resistors and over-coupled with a 10 $\mu\mu$fd. capacitor, *C4,* in order that the bandpass of the transformer will not affect the response of the filter amplitude characteristic. This transformer must have a "3-db. bandwidth" of three to four times the expected bandwidth of the filter at its (the filter's) 40-db. points. In other words, the transformer must be "broad as a barn door" so as not to



C1, C7—100 μμfd., 300v., mica.
C2, C5—0.01 μfd., 500v., disc ceramic.
C3—500 μμfd., 500v., mica.
C4—10 μμfd., 500v., mica.
C6—300 μμfd., 300v., mica.
C8—4.0 μfd., 400v.
R1—100,000 ohms, ½w.
R2, R3—100 ohms, 1w.
R4—33,000 ohms, 1w.
R5—50,000-ohm potentiometer.
R6—10,000 ohms, 1w.
R7—47,000 ohms, 1w.
R8, R9—10,000 ohms, ½w.
R10—68,000 ohms, ½w.
R11—100,000-ohm potentiometer.
R12—220,000 ohms, ½w.
R13—620 ohms, 1w.
R14—120 ohms, ½w.
R15—150,000 ohms, 2w.
Sw1—DPDT wafer switch.
T1—I-f transformer, Miller 1484-C.

Fig. 1. Parts list and schematic of the log-linear detector. This device is of great value in the alignment of SSB filters. See our book "Single Sideband Techniques" for complete details.

give a false indication of the filter passband response. The *Ferri-Sweeper* should be fed into the *Log-Linear Amplifier* directly at the *V1* grid circuit while the transformer is loaded and adjusted for the broad characteristic.

Calibrating the Log-Linear Amplifier

Now that we have an approximately logarithmic amplifier and detector arrangement we must calibrate it in order to make intelligent use of it. The circuit as shown is capable of giving a logarithmic response over approximately a 40-db. range of the input signal. It is now the builder's task to adjust the two controls labeled "Log-Zero Adj.", *R5,* and "Log Scale Adj.", *R11.* The *"Ferri-Sweeper* must be used to calibrate the unit. A pair of series voltage dividers made up of many carbon resistors should be connected across the r-f output of the *Ferri-Sweeper* so that voltage ratios of one-hundred-to-one, ten-to-one, and two-to-one, etc. are available for calibrating the 'scope scale in decibels. See *Fig. 2* for the schematics and the various db. calibration points.

The calibration run should be made using the following set-up: An i-f transformer in the 450-kc. range should be connected temporarily to the grid input terminal of the *Log-Linear Amplifier.* Any replacement or surplus i-f trans former will be satisfactory as long as it can b tuned to the range of interest to the user. Th *Ferri-Sweeper* should be connected across th input terminals of the resistance voltage-divide and the movable tap should be connected t the primary "hot" lead of the i-f transforme The ground lead should be returned to th ground end of the voltage divider.

With the *Log-Linear* unit set in the "Linear operating position of *Sw1,* the i-f transforme should be peaked at about 450 kc. The usua transformer response curve will be noted o the oscilloscope. With the tap on the voltage divider set for the "zero db." position, adjus the output control of the *Ferri-Sweeper* so tha the pip on the oscilloscope shows no signs o saturation or non-linearity in the i-f amplifie of the *Log-Linear* unit. Note—this is still wit *Sw1* in the *linear* position. Now switch *Sw* to the "log" position and you will notice tha the amplitude of the pip on the scope ma have changed size depending on where *R1* *(Figure 1)* is set. If *R11* was set all the wa to the top as shown in this figure the pi would decrease in size and if *R11* was set al the way to the bottom no change would tak place. Set *R11* for maximum a-v-c voltage (t the top) and make the following checks: Mov the tap on the voltage divider to the 20-db

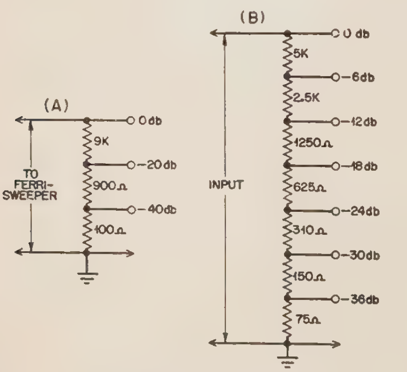


Figure 2. Two voltage dividers used to calibrate the log-linear amplifier unit. See text for details.

oint and determine how much the pip has ecreased in amplitude. We are aiming to-vard the end result of having the pip de-rease to one-half of its original size when the nput is dropped 20-db. (or ten-to-one in volt-ge). Your problem now is to arrive at a pair f settings for *R11* and *R5* so that the 20-db. eduction in input will produce a decrease in ip-size of one-half and a reduction of 40-db. in nput should leave just a pimple in the oscillo-ope base line—roughly one-tenth or less of the ze of the original pip. It will take a little doodling" and patience on your part, but a ombination of the two controls will give the esired results.

At this point the oscilloscope must be given "standard" gain adjustment to which it can e reset at any future date so that the calibra-on scale may be reused. The oscilloscope gain or the "zero-db." input attenuation tap should e set near full deflection on the oscilloscope ube screen. The second voltage divider should e substituted for the 20 and 40 db. divider so hat intermediate calibration points can be nade every 6 db. A piece of masking tape laced along the edge of the oscilloscope screen an serve as a calibration scale. Mark the zero-db." point on the tape opposite the point here the top of the pip comes from zero-db. ttenuation, and the proceed to increase the nput attenuation in six-db steps. At each step mark should be made on the tape opposite here the "nose" of the pip comes to rest. In his way you will be able to get a good cali-ration of the *Log Linear Amplifier*. From this point on, the settings of controls *R5* and *R11* are not to be disturbed, and proper notation of the oscilloscope gain settings must also be made so that the calibration will hold true for future experiments.

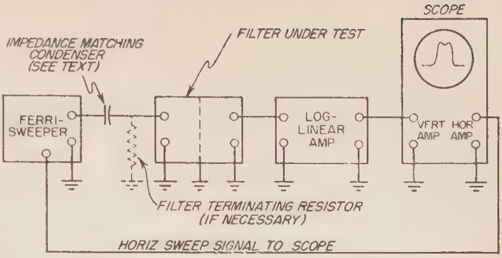
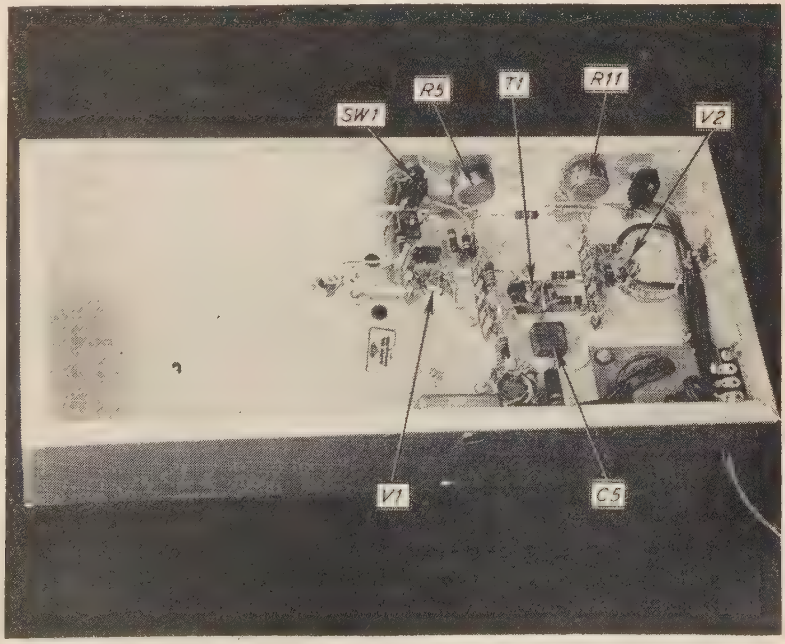


Fig. 3. This is the arrangement of the test equipment for an SSB filter alignment. The use of the "impedance matching" condenser was described on page 109 of our book "Single Sideband Techniques." Essentially, it is to avoid loading down the sweep generator output with the filter under test. The condenser should have a very small value and the author has found that 4.0 $\mu\mu$fd. is quite satisfactory.

All of the preceding procedure has been a bit involved, but for the serious minded experimenter shouldn't constitute a pit-fall.

See *Figure 3* for a block diagram of the equipment set-up to be used in aligning a filter using the *Ferri-Sweeper* and *Log-Linear Amplifier*. Proceed cautiously and patiently and the reward will be a good filter.



Under view of the log-linear amplifier and detector

the YL's Frequency

Louisa B. Sando, W5RZJ

Jicarilla Apache School, Dulce, New Mexico

Big news at the moment is the *International YLRL Convention* scheduled for next June. This will be the very first convention for YLRL, now in its 16th year. Convention chairman, W6UHA, Maxine, has set the date for the weekend of June 25, 1955. The place will be the beautiful Hotel Miramar on the shores of the Pacific Ocean at Santa Monica, California.

Results of the poll of YLRL members showed that the majority of YLs wishing a convention wanted it at a nice hotel, instead of trying to economize by using some public building. Hence, the selection of the Hotel Miramar, which Maxine found will be as reasonable as less popular places.

Watch this column for further details on the convention as Maxine, and the Los Angeles YLRC as her committee, develop plans for the affair. And start *your* planning now for that big weekend!

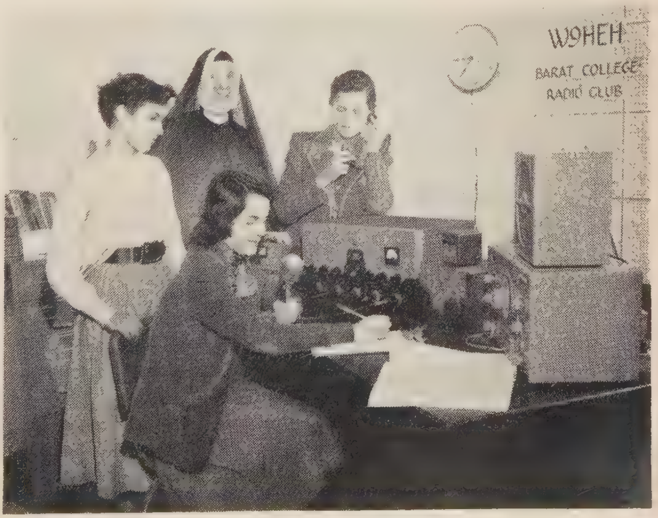
Nuns Are YLs

One of the wonderful things about our hobby is that *anyone* can become a Ham—young or old, rich or poor, lowly or exalted. Ham radio even serves with God, as many religious leaders are radio amateurs. There is a priests' radio club in southern Wisconsin, and many are the marriage ceremonies for Hams performed by ministers or priests who are themselves Hams.

Not so many are the YLs whose life work is religious service. Among the nuns, we know of only four who are licensed radio operators: *W9CLE*, Mother Lawrence; *W9CLW*, Mother Reilly; *W7MUT*, Sister Charlotte, and *W1HUH*, Sister Emiliana.

As with all of us, there had to be some special incentive that lead to an operator's license. In Mother Reilly's case, she became interested in shortwave radio when she wanted to copy messages directly from the Vatican and W9GAP installed one of his receivers for her at Barat College, Lake Forest, Ill., of which she was president for over twenty years. Mother Lawrence, then on leave from Barat to study for her Ph.D., became interested when she returned to Barat in 1950, and together the two nuns set to work to master code. Soon they were aided by W9BWR, a CPO at Great Lakes NTC, who taught them theory. In the spring of '51 they both received their general licenses.

Meanwhile some of Barat's students caught the amateur fever and the Barat College Radio Club was started, using the call W9HEH, and with Mother Lawrence as trustee. W9BWR continued to assist with instruction to the students and when he left for several years' duty in the Pacific he lent his equipment to the club. This consists of a 2-meter *Motorola* station with a ground plane antenna. Another station of W9BWR's Mother Lawrence has set up in the chemistry balance room (she is associate professor of chemistry) which is for the use of Novices primarily. The xmtr is an *Eldico TR-75*, the receiver an *SX-28*, and they use a center-fed halfwave antenna on the 80-meter Novice band. The main station of W9HEH is a *Viking II* with VFO,

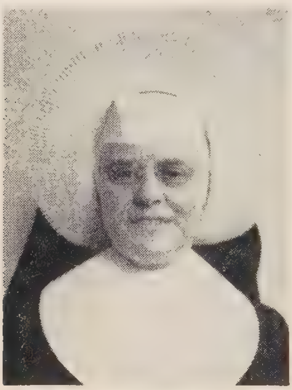


W9CLE, Mother Lawrence, center background, with members of the Barat College Radio Club operating its station W9HEH. At the mike is Ileana Viqueira from Puerto Rico. Standing, Astrid Manqual of Puerto Rico, left, and at right, Flor Rosales from Colombia. Waukegan News Sun photo.

Matchbox antenna coupler, TVI suppressor, SWR bridge and signal sentry. Receiver is an *HRO-7*. Antennas are an end-fed Zepp on 80 meters and a beam for 20 meters.

This summer Mother Reilly was transferred to head the psychology department of Forest Ridge College in Seattle, Wash., so Mother Lawrence carries on alone with the radio club at Barat College, with assistance from W9RON, chief engineer of their broadcast studio which has a wire to WKRS in Waukegan. Mother Lawrence reports the club is progressing well and the girls, despite a heavy college schedule, are asking for more time for Ham radio.

For many years *W1HUH*, Sister Emiliana, was the only nun to be a licensed amateur, having received her call in 1933. She operates from the convent of St. Xavier's in Providence, R.I. Sister Emiliana teaches shop work to the boys at Tyler School, the only Sister in the state to do such work. It was for the boys' sakes that she delved into radio and she took to it as naturally as she does her teaching, which includes everything from making bows and arrows to caulking boats. She teaches about 200 boys a week: 5th to 8th graders learn woodworking; 9th graders take drafting. W1HUH runs 500 watts mostly on 20 meters. She has WAS and likes to work DX, for she feels that amateur radio is one answer to world unity.



W7MUT, Sister Charlotte, operates from St. Teresa's Academy at Boise, Idaho.

The next nun to join Sister Emiliana as a YL was Sister Charlotte who became *W7MUT* in 1948. Her interest in radio dates back to crystal sets for she is a science teacher at St. Teresa's Academy at Boise, Idaho. Her interest in electronics grew for the benefit of her classes and at present she sponsors a radio club composed of girls and boys from the freshman class.

W7MUT started out with a 701 *McMurdo Silver* and an *NC57* which an aunt gave her on Sister Charlotte's silver jubilee of being a Sister. 80 and 40 CW were her first interest, then 10-meter phone. Sister Charlotte says her chief job in Ham radio now is to help prospective Hams as she also was helped, and she has given the exam to many around Boise. She also is a member of MARS, holds WAS and RCC certificates, and is a member of the Buzzard net, the Polecat net, and the Dogcatchers net. It was some of the "Buzzards" who built her present rig for her, brought it to her from California and installed it. She uses a 300-watt final, using 211's push-pull and 211's as modulators, driven by command transmitters. Her antenna is a 136 Zepp, plus a 10-meter beam on top of the sch and she receives with an *SX-28*.

This summer Sister Charlotte was awarded a lowship to Massachusetts Institute of Technol and while there visited W1HUH in Providen "What a wonderful person!" she exclaims—as ind all of these women must be. We are proud to h them in our ranks of YLs.

YLRL

President **W6CEE** lists these new YLRL appointmen District Chairman for Africa, **ZS6MW**, Joy Jones; Europe and England, **PAØZC**, Louise ten Herkel; New Zealand and Australia, **ZL4GR**, Myrtle Earland.

W6KER, YLRL VP, reports another net to add to list which appeared in this column last month: 40-me phone (7215 kc.), Thursdays, 10 a.m. EST, NCS W4S alternate W8HWX.

Conventions

Thirteen YLs attended the **Oregon Amateur Ra Convention** held at Klamath Falls in June: W7s N Beth; NTT, Lydia; ITZ, Ruth; GLK, Dot; RAX, Ju JFM, Doris, SBS, Luryne; UFN, Bertie; SBW, Pauli SBX, Helen; HHH, Bea; WN7VLI, Jacquetta, K6CXZ, Ray.

The **West Gulf Division Convention** held at Kerrvi Texas Oct. 2-3 was enjoyed by sixteen YLs. The XYL W5DEH, Martha, was in charge of YL and XYL tivities and entertainment included a style sh luncheon, bingo party, dance and other activities sha with the OMs. YLs attending: W5s WXT, Inez; Q Marge; TSE, Ella; DUR, Bruce; AMI, Fannie; Y Jane; KQG, Frances, EWH, Vivian; DEW, Mary; WN Mackey; JAD, Ethel; RYX, Lyn; SPV, Pat; SYL, I YAJ, Peggy; EGD, Lillian.

The **New England Division Convention** at Manches N.H., on Oct. 10, drew nearly thirty YLs from all the N.E. states and New York. A YLRL meeting held with W1VOS, Marge, as chairman. Lucky gal the evening was W1YPH, Leona, who won the prize a **Hallicrafters SX-88** receiver.

Congratulations

To **W2OWL** and OM who celebrated their 25th w ding anniversary Aug. 25. To **W3OQF**, Barbie, OM W3MAX on the arrival of a "second portable mod Robert, on Aug. 26. To **WN5EQW**, Anne, and W5DMO on arrival of a daughter in September.

To **WØQZS**, Marian, and **WØMCY** who were marr on Sept. 4. To **WØHQH**, Carol, and **WØBUR** who via Ham radio and who set their wedding date Sept. 5.

Here and There

When hurricanes **Carol** and **Edna** roared through N England these YLs assisted in handling emergency traf W1s VXC, June; YPT, Louise; VOS, Marge; UE Eunice; W2s JZX, Vi; BNC, Helen, and the other girls on the 2nd Regional Phone Net and the Interst Net. W1BCU did CD work. . . . **W1YYM**, Ellen, been faithfully carrying on beginners classes. La YLs to qualify for licenses under her tutelage are WI CIE, Connie; CIJ, Muriel; CIM, Lorraine, and C Joan. . . . **The Boulder** (Colo.) **Daily Camera** devoted entire section to the National Bureau of Standards the time of the dedication of the new NBS buildings Boulder in September by President Eisenhower. special interest was a fine photo of **W3LSX/Ø**, K shown grinding crystals in the CRPL. . . . The district YLs have enjoyed meeting the 3rd Thursday each month on 3900 kc. at 9:30 a.m. to get better quainted. . . . **W2WCL**, Kay is an assistant director the Hudson Division. . . . Ex-**W4HWR**, Hilda, back fr England, is now on 75 as **K2IWO**. . . . **W6QYL**, Mart has been hospitalized for several months. Her QT **Cabin 90, Box A, Cottingers Sanitarium, Monrovia, Ca**

Thanks to *W5CA*, W5RZJ is back on the air aga We'll be looking for YLs especially on 20 pho 'Till next month, 33—*W5RZJ*

ESSE XMAS SPECIALS

LEECE-NEVILLE 100 AMP. ALTERNATOR - - - $49.50

Originally Sells For $216.95

FEATURES:

1. 100 Amp. Charging Current
2. Charging current while motor idles
3. Eliminates generator hash & whine
4. AC output may be stepped up to operate 400 cycle surplus equipment

"SAVE OVER $100 ON THIS TREMENDOUS SURPLUS BUY."

e 5024 G3 alternator delivers up to 100 amperes of charging ent from 1500 Rpm to 12,000 Rpm. Alternator output is olts 3 phase AC (frequency is 1/10 Rpm). This is rectified dry disc rectifier supplied to produce 100 amps. at 6 V. h will end your mobile battery problems and allow you to that hi-power rig. Some amateurs are stepping up the AC ut of the alternator by suitable transformers and operating et the cheap 400 cycle surplus gear. Battery voltage & current lation si taken care of through the regulator supplied. These s replace your original 6 volt generator equip. by use of able mounts which may be obtained from your local Leece-lle distributor or we can supply at addn. cost. These new nting kits contain all necessary hardware and wiring where inal is not used. Price of these kits range from $20 to $50 rding to car or truck make and model.

Above alternator, rectifier, and Type 3044-R3 regulator for 60 amp. output with circuit diagram, used but guaranteed.............. **$49.50**

5024-G3 Alternator, rectifier, and 3082-R-3 regulator for 100 amp. output with circuit diagram, used but guaranteed.............. **$59.50**

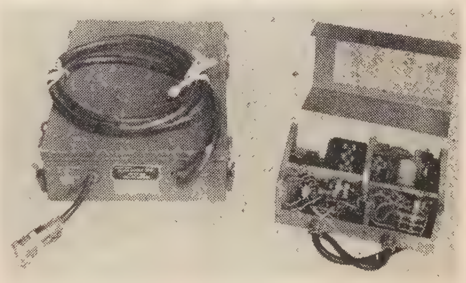
Include with order make and model of car or truck if mounting kit is desired (kit includes brackets, wiring harness, pulley and hardware). Kit cost $20 to $50 addn. and will be sent COD with order at prevalent factory price. Allow 10 days on kit orders as all types not in stock.

Ship wgt. alternator, rectifier and regulator 45 lbs.

6 OR 12 VOLT POWER SUPPLY - - - $3.95

117 vibrator power supply was designed for use on the Army 620 Transmitter and receiver a part of the SCR-509 and -510. This will make an ideal supply for your mobile equip- on either the 6 or 12 volt cars. Voltage input changes are nplished by merely changing links according to diagram in the r (same vibrator used in either case). Supply is well filtered g choke input and plug-in type capacitors. Additional hash filter- is also incorporated for filaments of receiver. Output voltages for transmitting 140 V. and 90 volts for receiving. The receiver ut voltage is regulated by voltage regulator tube VT184. Maxi- current drain is 100 Ma. Entire unit measures 12"x15"x4¾" ietal case or supply only may be removed for use which measures 6"x4½". If you have no immediate use for this unit, it would good investment for possible future use. This is the type of lus that doesn't last long at this price. Shipping wgt. approx. lbs.

Brand new units - - - $4.95
Used good units - - - $3.95



1-1 SERVO UNIT FOR BEAM ROTATION

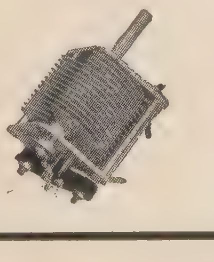
it has self-contained raulic pump actuated 27 V.—11 Amp. 1/5 hp. or which pumps oil into er side of hydraulic on giving better than 00 lb. torque to cable m. Unit is reversible by iation of either of two -contained solonoid hy-ulic valves. Connect by e around antenna beam any desired rotation d. Greater adaptability than any other surplus ce on the market. Shg. wgt. 37 lbs.
AND NEW—Only a few, order early **$4.95**

AN/ART-4 TRANSMITTERS & TARGET

6' x 30' plastic screen target containing two transmitters complete with microphones. One transmitter on 55.5 Mc., other on 56.75 Mc. ¾ watt output using 3A5 tubes. Dry battery operated (batteries not included). Brand new, in wood box 10" x 12" x 75". Shipping Wgt. 75 lbs. Box or plastic screen alone worth price.
NEW................ea. **$3.95**

RELAY - TELEPHONE TYPE SW 37

150 ohm DC. Adjustable for spring tension, amateur distance, and point contact, allows sensitivity variations. May be used also for telegraph sounder. Size 8"x4⅜"x 4". Shipping weight 3½ lbs.
New Price ....ea. **$3.95**



VARIABLE CONDENSER

Freq. Meter type, 245 MMFD. 27 plate mdgt. type. Gold plated heavily constructed. Approximately 3"x2½"x1¾" overall size with 1¼"-¼" shaft extension. Shipping weight 1 lb.
New Price ....ea. **$1.25**

The HOT ROD Bottle . . .

Have you ever cussed out the fellow Ham th drives the kilowatt and zeroes in on you to drov out your modest 50-watter? Have you ever want to be one of the Sunday morning boys on 14,000.0 If you have, then this might be the article to sol all your troubles.

First, take a look at this problem of high pow versus iron-clad regulations. It is written, ". . the input to the final amplifier shall not exceed 10 watts." Now applying basic logic, it follows that a tube could be invented that operated at a lo power input, but was capable of power multiplic tion (say fifty times) you could really gray the ha of the boys on kilowatt alley. For example, s you're pushing the old 807 at 50 watts input, b then you replaced it with an 807X that still dre only 50, although pumping out something 25 watts. Would you go for it? I suspect you wou and the beauty of it all is—I have just made such a tube and you can do it too. Interested?

Theory

Why do tube manufacturers evacuate the air fro the tubes they sell us? You immediately say, " that the filament will not meet an untimely sp tacular demise." But I say that this vacuum mak the passage of large quantities of electrons diffic . . . the reason present day tubes are inefficient.

Using high school logic once again, it follo that if a substance were pumped *into the tube* that did not support combustion—and which was good conductor of free electrons . . . well you c supply the rest.

Experiments

In my first experiments, I used the substance th was closest at hand—water, with a little salt add to improve the conductivity. It can be easily sho that a solution of salt water will conduct an elect current fifty times better than a vacuum. So t recipe for souping up your present final amplif is quite simple. Drill a hole in the plate cap, bei careful not to disturb the filament, and with t aid of a water pistol, squirt salt water into the tu until it is filled. Drop a blob of solder on the h in the plate cap and presto—HIGH POWER!

One of the first tubes I modified was a 6AK6. T glass seal was broken and the tube filled with s water. After replacing it in my transmitter, I to the r-f ammeter off the shelf and set the scale 100 amps. As I applied the juice to the 6AK6 t meter assumed a strange bluish hue and slowly t entire rig melted away. I wept—not at the sight my hard earned components running off the tab but with the proud happiness of a man that kno his name will be long remembered by fellow Han I had forgotten about the inverse power law—t smaller the bottle, the bigger the gain factor. Sub quent experiments with a big 4-400 showed th little gain results from the salt water treatment.

Yes, there is something new in Ham radio. Sin the high power boys won't be able to use th scheme, it looks as though the "small fry" will able to take over as the privileged class in Hamdo The possibilities are enormous. Currently I'm wo ing on a means to water those geraniums in a tra sistor. Who knows—WAZ with a hunk of rock m be just around the corner.

DAN BERESKIN, VE5D

DX NEWS

[*from page 24*]

OK1MB would also welcome one from YS10. . Catherine, OQ5GI, visited W3BHV while Al, W8P baid a visit to the shacks of W3CTJ, W3KT, W3L W3GHM, W3CGS, W3GHD and K2EDL.

21 Megacycles

During September and October a marked increase activity and improvement on this band has been noti In fact, at times, we thought we had switched to 14 by mistake. A report from Ross, W4DQU, notes conta with **EL1ØA, EL12A, ZS1BV, VQ2PL, ZE2JE VQ4**

New Addresses

C3AR—CWO N. H. Morgan, OARMA, APO 63, c/o P San Francisco, Calif.
CN8IA—Don, Box 50, Navy 214, FPO. N.Y.
CN8IE—Via W2ARE.
CR7MB—Box 12, Quelimane, Mozambique. P.E.A.
CR9AH—Joao Pires Antas, Oficinalis Navais, Macao.
FA8GC—Jean Tolzane, Chez les Pere Blancs, Ouarg Terr. des Oasis, Dep. de Constantine, Alger
FE8AN—Marcel Veber, Box 408, Douala, Camero F.E.A.
FF8AJ—Box 396, Abidjan, Ivory Coast, F.W.A.
FQ8AA—Box 449, Brazzaville, F.E.A.
FU8AC—V. H. Fonsagrive, Port-Vila, New Hebrides.
HC4MK—Martin Kohls, Box 2327, Quito, Ecuador.
JDXRC—Japanese DX Radio Club, Box 7, Nerir Tokyo, Japan.
KR6IG—(Chi Chi Jima) Navy 905, P.M. San Francis Calif.
KV4BJ—Ed Kendall, C.A.A. Box 618, Christiansted, Croix, Virgin Is.
TI2RMA—Ricardo Montealegre A., Apartado 1523, S Jose, Costa Rica.
ex-TI2TG—Tom Gabbert, 1820 Poli St., Ventura, Cali
VP6KL—(ex-G2KL) Frank Roberts, Watersmeet, Wor ing, Barbados, B.W.I.
VQ6LQ—Chas. Box 11, Hargeisa, Br. Somaliland.
VS2—(pending) ex-G3GUK/VS9AW—Cpl. H. J. Wheel 3500323, No. 1 Rec. Station Chiakeng, R Maintenance Base, Seletar, Singapore Malaya.
XZ2OM—F/LT Aung Myint, BAF. Box 1490, GH Rangoon, Burma.
ZB1CH—Chas. Holmes, Point de Vue Hotel, Rabat, Mal
ZC7AM—Via G6UT.
ZP5GM—American Embassy, Asuncion, Paraguay.
4S7YL—Soma. Swarna Paya, Piliyaneala, Ceylon. (X of 4S7WA)

Thanks to KV4BB, W6YK, KR6OS, VQ2AB, W6TK F9RS and the West Gulf DX Bulletin.

Honor Roll Endorsements

W6MEK	40-248	W9HUZ	39-216	GM3EST	38-2
W6SYG	40-247	KP4KD	39-207	W2GVZ	38-1
W9NDA	40-244	W3KDP	39-203	OE1FF	38-1
VE4RO	40-240	W4RBQ	39-198	PHONE	ONLY
W6VE	40-228	W6GPB	39-197	W9NDA	38-2
W5GEL	40-212	G3FXB	39-181	W1MCW	36-2
W8KIA	39-239	W1HA	38-205		

Last complete HONOR ROLL appeared in the Oct. iss Next complete HONOR ROLL will appear in an ea issue.

F9OO, CT1SX among many others. VQ4EZ reports VQ5E YI5AM, ZC7BB, VS9 and 4S7 while LU8DB repo EAØAC and SVØWO. ZD9AC was heard on 21,100. the above are phone reports and A3 activity seems predominate. It would be well to keep an eye on t band as conditions improve. It's a welcome relief fr the congestion encountered on twenty. Maritime Mob activity has done much to sponsor increased activity he

160 Meters

The December transatlantic tests take place on the fi and nineteenth at 0500/0800 GMT. Watch for G (a other) stations between 1825 and 1875 kc. New Zeala

[*Continued on next page*]

[*from preceding page*]

stations will use their new band, 1875/1900. Eas U.S.A. stations will use their assigned frequencie 1800/1825 and 1875/1900 while stations west of Mississippi appear on 1900/1925 and 1975/2000 kc. avoid mixups in calling and answering please synchr your clocks to zero hour, 0500 GMT. An idea of possibilities may be had from G3EIZ who advises W2 and W4 250-watt BC stations are heard quite just before sunrise (0500/0530 GMT August) on 1240 and 1400 kcs. when WWV gives its forecast as " A report from Shely, W3RGQ, states that 160-m crystals will be sent to any DX station so requestin he will participate in top band activity. This is spons by the **TOP BAND DX CLUB.** A few DX stations have promised to appear are: **EL2X, YV5DE, TI HK4DP, LU3EL, VR3A, VE8MW** and others. **YU1 FA8BG** and **EI9J** will request special permission to this band on a set frequency. Others known to be a are **VS6CQ, VS6CW, VS6CZ, VS1FX, VS2EB, H ZC5VS, ZC4CA, ZC4GF** and **ZB1BJ.** Your reports be welcomed at W1BB and W3RGQ. See you there!

MY FINAL EXCITER

[*from page 20*]

may be plugged in to determine just what grid current is, if that information should desired.

For CW, switch *Sw2* bypasses the plate rent meter and allows the meter to remain rest rather than following the keying cycle.

A clamp tube is used to keep the plate rent down during periods when no excitat is applied. The popular 6Y6G tube, used alo permitted the 6146 to draw enough curren just equal its rated dissipation rating. To g the 6146 time to cool off once in a while 6F6 was substituted and the VR105 instal Now the clamping is much more effec because the voltage on the 6146 screen dr to zero when the 6F6 draws enough rent to drop the voltage across the VR t below 105, where it stops conducting. Resis *R21* is the means by which the screen volt is set at the desired figure for normal ope tion with excitation and a plate load.

Clamp-tube modulation was not conte plated in the design of this amplifier. If or any type of screen modulation is used will be necessary, of course, to short out VR105, *V9*. This also applies in the case plate-screen modulation, since *V9* will in duce serious clipping in the screen circuit, sulting in modulation distortion.

The amplifier case is divided in the mid by a copper partition which shields the 6 tube and the output circuit. This copper sh is used for all ground connections. The g input jack and its r.f. choke are on the "out side of the partition but individually enclo and shielded. There is no r.f. loose in the compartment, so the wiring around the cla tube, meter, tuning eye, etc. need not shielded.

[*Continued on page 54*]

[*from page 52*]

At the author's location the only anten the well-known "random length of wire" up and out to a tree. The pi-network o circuit is a natural for this and loads it up. The coil is variable, a "roller" an coil from a BC-458 "Command" transm The tuning condensers shown are from a c of "Gibson Girl" distress transmitters and very well, especially with the little switch c shaft that hooks in an additional 200 capacity across half the dial. *National TM* or similar variable condensers should be fi substitutes. If the antenna impedances matched are low (no higher than 300 ohr paralleled multi-section b.c. condenser (u about 140 $\mu\mu$fd. per section) should work for *C24*. The front panel was spaced so output condenser *C24* could be replaced tap switch for connecting in various fixe pacitors to match co-ax impedance, in case was generated to make necessary the u co-ax cable to a harmonic filter and/or ant tuner. This happily proved to be comp unnecessary.

R16 is adjusted for optimum grid cu (about 3 ma. for the 6146), *R17* is adjust that the tuning eye closes at maximum e tion (resonance of exciter output circuit), *R21* is adjusted for correct screen vo (max. 250 v. for 6146).

Power Supply

As mentioned before, the exciter power uly was included in the exciter chassis o author's rig, and its circuit is that show *Fig. 3*. This figure also shows a suitable voltage supply for the 6146 final. Any supply furnishing from 500 to 750 volts d 150 ma. will do.

In the exciter supply pictured here, a pilot lamp was used in place of the fuse This serves as a ½-amp. fuse and pilot l and gives an immediate visual indication of overloads. This drops the primary volta the transformer by about 2 volts, which m may not be desirable in your location.

The slider on the VR-tube dropping res *R22*, should be set slightly above the where the tube extinguishes with the excit operation, so that the tube stays lit unde normal load conditions.

Operation and Performance

For CW, it is necessary only to press c the key to transmit, since the final plate vo may be left on during listening periods. change frequency, or VFO up and down band, it is necessary to retune the dual denser *C14-C18*—if there is an apprec change. Just tune this control for a maxi setting on the "magic eye." However, it

[*Continued on page 56*]

[*from page 54*]

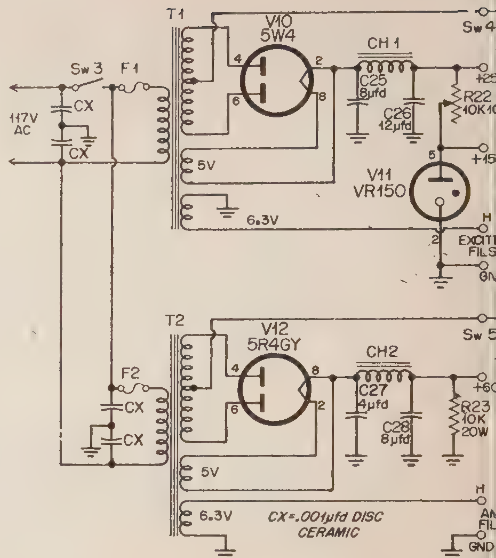


Fig. 3. Power supply diagram and parts list.

M—0-200 ma., d-c meter.
C25—8.0 $\mu\mu$fd., 450v., electrolytic.
C26—12.0 μfd., 450v., electrolytic.
C27—4.0 μfd., 900v.
C28—8.0 μfd., 900v.
F1—1 amp. fuse or #43 pilot bulb (see text).
F2—3-amp. fuse.
Ch1—30 henries, 50 ma., choke.
Ch2—10 henries, 150 ma., choke.
R22—10,000 ohms, 10 watt, wire wound, adjustable.
R23—10,000 ohms, 20 watt, wire wound.
T1—Small receiver ty[pe] power transformer with suitable high voltage and filamen[t] windings.
T2—Power transform[er] 600-0-600v., 5v. at 3 amp., 6.3v. at 2 am[p]
Sw3, Sw4, Sw5—SPST toggle switches.

be *highly recommended* that both plate su[p]plies be turned off before reaching into t[he] final or exciter to make adjustments. For A[M] operation, the final power-supply switch (*S[w]... Fig. 3*) may be used to turn off the transmitt[er]. If switching off the v.f.o. signal is desired wh[ile] listening, this may be accomplished by inse[rt]ing a switch or key at *J1*.

So far this rig has been used only on CW e[x]cept for one evening when a borrowed pla[te] modulator was attached to it and a local test w[as] run with a nearby Ham. There was a co[n]siderable mis-match of impedances and t[he] quality was poor, but there were none of th[e] black bars across the TV screen which so oft[en] accompany such endeavors. On CW the sign[al] reports are quite gratifying. Even Hams rig[ht] in town report, "No clicks—No chirps—No bac[k] wave." From the neighbors there are no r[e]ports whatever. They are just as polite, ju[st] as friendly, and just as unsuspicious as ever [of] my amateur radio activities.

NOVICE SHACK

[*from page 31*]

was an **S-53A**, later replaced with an **NC-98**—both a[re] good. . . . Pardon my mentioning it, but I owe m[y] mastery of the code to consistent copying of the W1A[W] code-practice sessions."

"Doc" Metke, **KN6HLO**, 511 Oak St., Roseville, Cali[f.] reports; "I am ten years old and have had my licen[se] for ten days. I run about 75 watts to a **Lysco 60**[0]. Antenna is 130 feet long and 60 feet high, centerf[ed] with RG-8/U coaxial cable, and the receiver is an **H**[Q-]**120X**. So far I have had 12 contacts on 3.7 Mc. . . My Dad, W6SUP, and my Mother, K6GKR, let m[e] operate only one hour a day on school days, but I ca[n] get on more on Saturday and Sunday. Dad says I ca[n] get on 7 Mc. in about two months."

Dick Maher, **WNØVZI/Ø**, 2325 South 10th, Lincol[n], Nebr., says; "I note that Nebraska is rarely mentione[d] in the **Novice Shack**; so I decided to write. My trans[-] mitter uses a 6AG7 driving a 6L6 to 35 watts inpu[t] and my receiver is an S-38C. I will be glad to set u[p] schedules with anyone needing Nebraska, and I will b[e] happy to help anyone in the Lincoln area with his code."

Help Wanted

Diane Garlock (15), 902 N. Harrison, **Mason City, Iowa.**

Robert W. Meyer, R. 5, Box 83A, **Stockton, Calif.** Phone 13F3.

Hugh Bonney (13), 15 W. Chestnut St., **Mount Vernon, Ohio.**

Joe Procok (15), 138 Peach St., **Catasaugua, Pennsylvania.**

Charles Edward Barbare (17), General Delivery, **Crestview, Fla.**

Frank Skiles (16), R.R. 1, Box 301, **Savanna, Ill.**

Pvt. D. M. Richmond, RA-1640823, H & S Co., 73rd Tank Bn., APO 7, c/o Postmaster, San Francisco, Calif. (Has passed his Novice examination, but he still does not have his license. He and his Ham buddies would appreciate receiving literature on Ham radio. Dave will answer **all** letters received.)

Each month *CQ* lists the names and addresses of prospective amateurs needing assistance with code or theory. To have your name listed, please address your request to: Herb Brier, W9EGQ, 385 Johnson St., Gary 3, Indiana. Requests received by December 15 will appear in the February issue.

Azad M. "Dom" Dombourian, **W5ZNI**, 7800 Washin[g]ton Ave., New Orleans, La., reports; "The **Greater Ne[w] Orleans Amateur Radio Club** has code and theory class[es] every Monday and Wednesday at 8:00 p.m. They a[re] held in the Physics Building of Loyola Universit[y]. Loyola was kind enough to supply the room, and t[he] U.S. Navy lends us film and other necessary materia[l]. This year's class started with 115 students, 15 to [2] being women. Last year, we graduated about 30 out [of] the 100 who started. There are no restrictions and r[o] costs."

Hank Jung, **W3YLL**, 213 N. 10th St., Philadelphia, Pa., says; "In three months as a Novice I worked [?] states. In two months as a General, I have added on[ly] one more towards my WAS (Worked All States), whic[h] leads me to believe that I should have stayed a Novic[e], hi. I'm usually on 3695 kc. after 2:00 a.m. (I work t[he] swing shift) and call 'CQ WN'; so would welcome [a] call from any Novice who needs a W3 or Pennsylvan[ia] contact. My transmitter is now a 6AG7-6L6 running [?]

[*Continued on page 60*]

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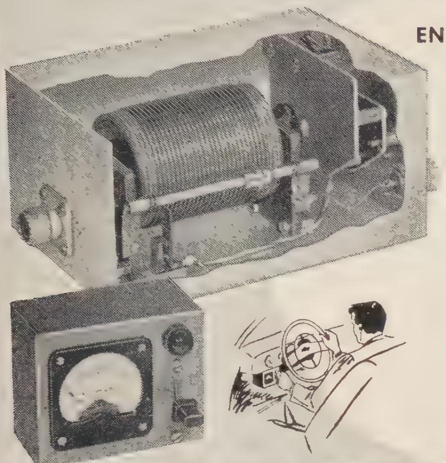

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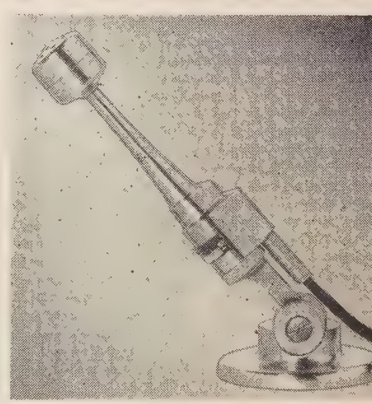

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watts, and the receiver is an NC-183D. The receiver is hardly compatible with my present transmitter, but I am building a new 90-watt one."

Steve Case, **WN7WSS**, RFD #1, Vernal, Utah, reports: "In one month as a Novice I have worked 27 states, with 22 confirmed. Man! Does that **TR-75TV** get out. My NC-57 does a good job, too. I don't think my record is too bad, considering I have football practice every night, and I work at broadcast station, KJAM, after school until 2200, when I get on 7198 Mc. Most of the stations I work say I am their first Utah contact."

Don Borson, **WNØTJH**, Ytterboe Hall, St. Olaf College, Northfield, Minn., writes; "I have had my Novice license for five months, but I have been on the air for only 2½ months. In that time, I have worked 85 Hams in 15 states. Nothing to brag about, but I'm satisfied. At first I was on 3.7 Mc.; then I switched to 7 Mc., which is much better for pulling in new states. . . . My transmitter is a **TBS-50**, my receiver is an NC-88, with separate ½-wave antennas for the two bands."

Ron Yantz, **WN1AZN**, R.D. #1, Jericho, Vt., makes two offers: "I'll be glad to arrange a schedule with anyone needing Vermont for WAS, and I imagine there are a few, hi. Also, I offer to help any prospective amateur in learning the code, if he has access to a tape recorder and is willing to conduct practice sessions from far off by tape. . . . At present, I run 60 watts to a six ½-wave 'V' beam antenna on 7 Mc."

Coincidentally, I received letters from two readers in Gothenburg, Sweden, within a few days. The first one is from Mr. Sture Christianson, Klareborgsgatan 14, Gothenburg V, Sweden. He writes; "My interest for radio came one night when I didn't know what to do. Then I came to think of the radio near me. I had never listened in to the short waves before, but this night I did. Yes, I became a DX'er that night and now I am studying for my license. I would like very much to have a pen pal among the Novices over in the U.S.A."

Kjell Drotz, Sodra Kustbanegatan 57B, Gothenburg 5, Sweden, writes; "I am 17 years old, and I have been interested in radio for two years. I am only a listener for the present, but I hope to get my license in the winter. . . . I would very much like to get a pen pal in the U.S.A., possibly a YL."

Again I have used all my space, but before I go, let me wish each and every one of you a *Merry Christmas.*

Keep your letters and pictures coming. *73, Herb.*

COMMON SENSE ANTENNA DESIGN

[*from page 14*]

point in the circuit to a lower voltage point, as the capacity between *Z* and ground is increased in relation to the total tuning capacity. Of course the "outer" capacitor is varied to maintain resonance. For a balanced two-wire system, the two inner condensers may be ganged, and the two outer condensers ganged with their rotors electrically separated; but for unbalanced lines, four separate capacitors will be preferable when using the circuit depicted here.

Preliminary adjustments for the single-wire feed system, using tuner circuit *4a*, might be as follows:

[*Continued on page 62*]

1. Connect tap "*X*" (the hot lead of the transmitter output line) one or two turns from the grounded end of the coil.
2. Connect "*Y*" on the coil at a point where resonance (maximum neon bulb brilliance) is reached at some appropriate capacity setting.
3. Connect "*Z*" on the coil about 5 turns from the ground end (more if the antenna impedance is known to be high, and less if the antenna impedance is known to be very low.)
4. Retune the capacitor for resonance. Caution: Keep the transmitter resonated during all of these adjustments, and avoid r-f burns by not touching "hot" circuit points while the transmitter is on. If these adjustments interact too seriously with the transmitter adjustments, loosen the coupling at the transmitter, or tap "*X*" closer to ground.
5. Now observe:

   A. If step four requires less capacity than was used in step two, the antenna is capacitive.
   B. If step four requires an increase in capacity, the antenna is inductive.
   C. If the tuning at step four is very broad, the *Q* of the tuner is low.
   D. If the tuning at step four is sharp, and connecting the antenna had little effect on adjustment, the *Q* is high: the antenna is not taking much power.

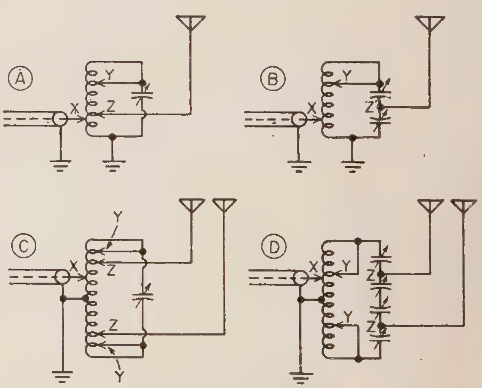


***Fig. 4.** Some of the antenna tuners described in the text.*

For the two-wire system, *Fig. 4c*, a similar process is used. Although *4c* shows a single-section capacitor, a split-stator unit may be preferable; but if this is used, no ground should be placed on the capacitor rotor. A virtual ground will appear here, reducing hand capacity effects and unbalance through stray circuit components; although the rotor may be "hot" with some incorrect adjustments. If the single-section capacitor is used, an insulated shaft is required to prevent r-f burns from the condens-

[from preceding page]

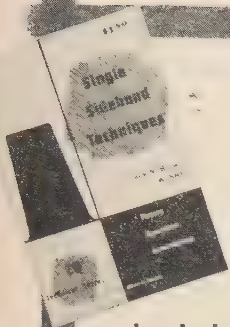
er shaft, and to avoid "hand capacity" effects on tuning.

The *"Y"* taps for the two-wire system should be equidistant from ground. The *"Z"* taps will be equidistant if the system is balanced, but if not, the lower impedance (to ground) feeder will tap closer to the grounded point on the coil.

After the initial adjustments, keep varying any necessary taps until proper transmitter loading is obtained with about the same settings of transmitter controls as those recorded while feeding the dummy. Be sure the *Q* is not too high. Adjusting any of the taps will affect the *Q* and the loading. The transformer action between the *X* and *Z* taps is not as predictable as we might wish, so that no fixed relationship between "turns ratio" and "impedance ratio" may be delineated for this type of transformer. Patience, and a little luck, will probably produce as effective an adjustment of the tuner as expensive instruments and special knowledge. The exact process is seldom the same for two cases, but the experience gained in evolving your own best procedure will be valuable. If the antenna is very short, it will require frequent retuning when you change frequency regardless of how the tuner is adjusted.

It takes a long time to evaluate an antenna. One station (100 watts) used a slanting 70-foot doublet (balanced) with a 22-foot open wire feedline, to work all continents except Asia on 3.5 Mc. A 600-foot balanced doublet with 220 feet of open-wire feedline has been observed to give excellent signals, although with considerable directivity as might be expected. A nearly horizontal 125-foot flat-top, with a single-wire feeder about 25 feet long attached approximately 45 feet from one end, has put good signals into New Zealand and Africa on 80 meters, even though these areas lie directly off the ends of the flat-top. Not designed primarily for DX, all of the above antennas have been used to work 48 states during one weekend on 80 and 40 meters, running 100 watts. This transmitter had a pi-section output network, but a separate antenna tuner was found advantageous.

Poor signal reports don't necessarily mean poor signals, unless they are comparative reports, or averages over long periods of time. Unanswered calls may mean that you are not "working out," but they may also mean calls which were not made intelligently. While calling a station, imagine what *he* is doing. When you picture his receiver dial hitting your frequency, wind up the call. If he's not there, try to figure out *why!* Any of the antennas suggested here, when properly located and correctly tuned, should produce a high average percentage of answered calls, and good signal reports.



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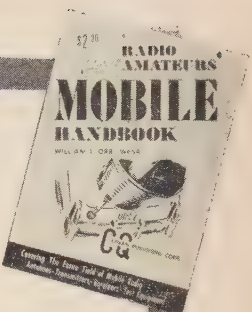

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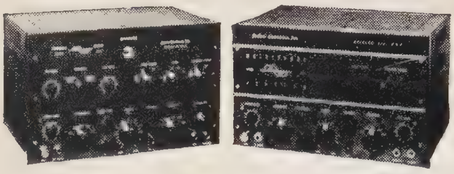

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NC-88 Communications receiver, guarantee new condition. $89.00. W6ODD, Box 776, Camarillo, California.

ROCKY MOUNTAIN headquarters for SSB. Central kits or wired in stock. Real bargains; new or reconditioned Elmac, Gonset, Morrow, Collins, Johnson, Hammarlund, National, Hallicrafters, RME, others. Reconditioned S40A $60, S40B $69, S76 $125, NC125 $130, NC183 $190, RME45 $90, S53A, NC33, 02 Heathscope, 2T Panadaptor, Bandmaster Sr., Super-ceiver, ST203A, Subraco MT15X, DB22A, HT-9. We trade. Easy terms. Write: Mel, WØGQY, Rogers Radio Company, 1745 Arapahoe St., Denver, Colorado.

PORTABLE TYPEWRITER and bug key $16.50 FOB. Bill Parker, New Haven, West Virginia.

SELL—S-40B receiver. Excellent condition with "S" Meter added. $90. Alan Steger, Box 97, Huntington Station, New York.

For Sale:

FOR SALE: HRO-60 coils and speaker, like new $35 Viking II factory wired like new $250. Viking VFO fa tory wired $40. 3-element 10 and 20 Johnson beam rotator, indicator, relays, 48 ft. aluminum tower. Com plete $175. FOB. J. W. Smith, 469 Dawson Ave., Lon Beach 14, California.

MUST SELL COMPLETE STATION. Consists B & W 5100 and National HRO-50T1. Transmitter brand ne with less than five hours operation. Receiver in exce lent condition and complete with matching speaker. Na tional XCU-50-2 crystal calibrator and ABCD coils. Wi ship freight prepaid anywhere stateside in original fa tory cartons. Want $395 for transmitter and $275 fo receiver. Will sell both and include 22X mike, 50' RG8/U and 110-volt coax relay for $600. WØAQJ, 6704 Nort 31st Ave., Omaha 11, Nebraska.

FREE GIFT new Astatic D-104 microphone with eac purchase of Elmac AF-67, or Gonset Communicator. You choice of either Vest Pocket beam, Shortbeam, or Bantam beam with each new Hallicrafter SX-96 receiver. Bear and microphone with each new SX-88. Tell us what yo want. We'll make you a real deal! National Hi-Fi com ponents. Many terrific bargains! Telcoa, Azurelee Dom Malibu, California. Tel: Globe 6-2611. Write, wire, o phone anytime!

HRO-60 TABLE MODEL, xtal calibrator, coils, perfec $475. BC-610 transmitter—Millen Eco. excellent $425 W7BDW, 10910 Algonquin Rd., Edmonds, Washingto

JOHNSON HCS 500-watt coils VCL 80, 40, 20, 10. Jac Bar link assembly new $10. National TMA 100 DA, ne $7. B & W JVL coils 40, 20, 10 $1. each. Bud 75-wat end link 40, 10 $1. each. UTC S-62 new $3.50. Fou Linguaphone code records, no book, $4. Plus postag Bradley, W8BTC, Route #1, Warren, Ohio.

SELL: Collins 75A-2-A with 3kc, 6kc filters, speake $445; 32V-1 $375; 32V-3 $595. 21A teletype midget tap printer $49. Tape transmitter $25. 12,000-ohm d.p.d.t 110 v.d.c. relays $1.75. Collins 30-J with 3100 $425 Boehme perforated tape keyer for Morse code with Mc Elroy 3-Key perforator $145. HRO-5TA1 with coils, speak er and power supply $165. NC-88 $75. Will take Ham o surplus equipment in trade. Tom Howard, W1AFN, 4 Mt. Vernon St., Boston 8, Mass. RIchmond 2-0916.

FOR SALE: BC453 Command receiver, range 200-550 kc The famous Q-5er. New condition, unaltered, with tube $17.00. Selectoject, like new, $10. Command transmitte dual rack, with plugs, $5. C. H. Scheifley, M.D., May Clinic, Rochester, Minnesota.

TVI proofed 32V1, B & W low pass, co-ax relay, antenn coupler, D-104, push to talk, connectors $400. SX-28A matching speaker $160. HF-10-20 $55. SP-44 panadapto $60. Ten-meter Elincor beam, rotator, selsyns $50. Colo rado sales preferred, Estate WØFHM. Mrs. Anna Palm 1648 Ninth St., Boulder, Colorado. Phone HI 3-0643.

BUY SURPLUS radio equipment from U.S. Government List $1.00. Details 10c Ham Box 213, E. Hartford, Conn

NATIONAL HRO-60, A-1 condition, complete with match ing speaker, six coils "A," "B," "C," "D," "E," an "F," $425. WNØVKI, Dick Rosenquist, 2558 Ida Street Omaha, Nebraska.

COLLINS 32V3, like new, used less than 10 hours $600 National NC-183 w/speaker, good condition $200. Do DeShazo Jr., W9BVC, 529 Blackstone, LaGrange, Ill.

FOR SALE: Wilcox F3 receiver $25; GR 726A VTVM $50; Federal LX1 Signal generator 8-330 Mc. $350; GE LR3 secondary frequency standard $585; GE YYZ1 dec ade scaling unit $85; Stancor ST203A 10-11 mete mobile transmitter $35; BCR-645 $10; WE 124-B ampli fier $95; RCA 1" oscilloscope $15; McElroy tape pulle $4; WE composite set (3 telephone plus 4 telegraph signal circuits on 2 pair wires) $95; EE89A telephon repeater $9; RM29A remote control unit $18; WE 255A relay covers 45C; Radiolab 52L amplifier $29; Communi cation equipment 12D telephone repeater $19. All guaran teed excellent electrical and mechanical condition. FOB W6ITH, Moraga, California.

HAMS: Pay cash & save. New radio gear with full fac tory guarantee. No trades. Contact Olde Rex "Electroni Heights" 5 Retrop Road, Natick, Massachusetts.

SACRIFICE—813 final 10-20 phone transmitter, ARC 5 rigs 40-80. BC604 NBFM CW rig for 10-15. Wester Electric 28A mobile transmitter complete. Volt-ohmeter and tube testers, signal generators, transmitting tubes transformers, condensers, chokes and RME 45 receiver H. MacLeod, W2CIT, 3919 William St., Seaford, N. Y

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high power at lower plate

RCA Amplifier Service—Max. Amateur Ratings, Class C

RCA No.	Type	DC Plate input (watts)	DC P Vol
2E26	Beam Power	40	60
807	Beam Power	75	75
810	Triode	750	250
811A	Triode	260	150
812A	Triode	260	150
813	Beam Power	500	225
815	Twin Beam Power	75*	50
829B	Twin Beam Power	120*	75
832A	Twin Beam Power	50*	75
833A	Triode	1000	330
5763	Beam Power	17	35
6146	Beam Power	90	75
6524	Twin Beam Power	85	60
8000	Triode	750	250
8005	Triode	300	150

*Total for tube